

JOURNAL OF THE LEPIDOPTERISTS' SOCIETY

Volume 17

1963

Number 4

PHILOTES OF CENTRAL COASTAL CALIFORNIA (LYCAENIDAE)

by ROBERT L. LANGSTON

In central coastal California, five entities of *Philotes* are known to occur: one subspecies of *P. battoides* (Behr); three subspecies of *P. enoptes* (Boisduval); and *P. sonorensis* (Felder & Felder).

TAXA

In a commonly used check-list (McDunnough, 1938), and other familiar literature, the genus *Philotes* Scudder was placed in the family Lycaenidae, subfamily Plebeinae. Recently (Clench, 1961), this genus (along with the other so-called "Blues") has been placed in the following manner: family Lycaenidae, subfamily Lycaeninae, tribe Plebejini. The scope of this paper is neither to accept nor reject any changes in the higher taxa, but to consider only a single genus within a specified geographical area.

GEOGRAPHICAL AREA

The area considered in the present study encompasses the region in central and northern California from the southern part of Monterey County to the northern limits of Sonoma County, and inland to the Sacramento and San Joaquin Valleys. This area essentially includes both the immediate coast (Santa Lucia Range and Monterey dunes area to the North Coast Range), and the inner Coast Range (Mt. Hamilton and Diablo Ranges to the Vaca Mountains). The boundaries for this area were governed by several factors: 1) on the west by the Pacific Ocean; 2) on the east by the Central Valley where the host plants become sparse and non-existent; and 3) on the north and south

by lack of records. This last factor may seem somewhat artificial, but negative information, in this case, is important to indicate where further surveys should be made.

Although there are numerous records of the various species and subspecies of *Philotes* in southern California, the Sierra Nevada and Cascade Mountains, I have not seen specimens representing localities within several hundred miles either to the north or south of the above defined central coastal area. Collections in three major museums were examined, and all are lacking records from Sonoma County north to Oregon. There is also a gap between Monterey County and Los Angeles County from which no museum specimens have been deposited. Several collectors in California have been contacted, but no records were forthcoming for these "negative" areas.

PLANT COMMUNITIES

Essentially, the localities in which *Philotes* were found are in the Upper Sonoran Life Zone. Most of these areas are in the lower foothill belt, which is a grassland formation with scattered growth of various indicators, the more prominent being Coast Live Oak (*Quercus agrifolia*), Coyote Brush (*Baccharis pilularis consanguinea*), and Bush Monkey-flower (*Diplacus aurantiacus*). However, some were taken in the Redwood Transition Zone, with Madrone (*Arbutus menziesii*), Bay Tree (*Umbellularia californica*), and California Buckeye (*Aesculus californica*) in association. One subspecies of *Philotes enoptes* occurred at slightly higher elevations, only within the upper foothill woodland, indicators being Digger Pine (*Pinus sabiniana*). Chamise (*Adenostoma fasciculatum*), and California Yerba Santa (*Eriodictyon californicum*).

HOST PLANTS

The known host plants of all except one *Philotes* within the area treated are various species of *Eriogonum* (Polygonaceae — Buckwheat family). *Philotes sonorensis* feeds on *Dudleya* and *Sedum* (Crassulaceae — Stonecrop family). Plants upon which these insects were actually found in very close association, in most cases utilizing these as the only nectar source and oviposition site, are as follows:

Eriogonum latifolium Smith

E. latifolium Smith subsp. *auriculatum* (Bentham) S. Stokes

E. latifolium Smith subsp. *nudum* (Douglas ex Bentham) S. Stokes

E. fasciculatum Bentham subsp. *foliolosum* (Nuttall) S. Stokes

E. parvifolium Smith

Dudleya cymosa (Lemaire) subsp. *setchellii* (Jepson) Moran

Listed below are plants in the same genera which were examined in the study area and upon which no *Philotes* have yet been found. Some of these were growing in the same plant association as those above, others were in adjacent areas or in "probable" situations. Some of these were searched for several seasons, often on the same days that specimens were taken on the "positive" plants.

Eriogonum virgatum Benth

E. wrightii Torrey ex Benth subsp. *trachygonum* (Torrey) S. Stokes

E. elongatum Benth

E. latifolium Smith subsp. *saxicola* (Heller) S. Stokes

E. fasciculatum Benth subsp. *polifolium* (Benth) S. Stokes

Dudleya farinosa (Lindley) Britton & Rose

D. caespitosa (Haworth) Britton & Rose

All of the plants listed were determined at the Herbarium of the University of California, Berkeley. Reference to each of these plants will be made under the individual treatment of the insects concerned, but are listed here to give the complete taxa as identified for me by the Herbarium Staff. The plants are listed in the sequence in which they appear in Munz (1959), and the plant distributions and life zone concept were also correlated with Jepson (1925). For purposes of general discussion, *E. latifolium* (with its subspecies), *E. virgatum*, and *E. elongatum* are referred to as "herbaceous-type." *E. fasciculatum*, *E. parvifolium*, and *E. wrightii* with their respective subspecies are considered "shrub-type."

ABBREVIATIONS

The museums where specimens are on deposit are: California Academy of Sciences, San Francisco (CAS); California Insect Survey, Berkeley (CIS); and Los Angeles County Museum (LACM). Surnames of authors or collectors are given in full, but the initials of collectors are included only where they first appear. Where a collector's name appears followed by a museum abbreviation, it indicates specimens already on deposit in the museum at the inception of this study.

Philotes battoides bernardino Barnes & McDunnough

Philotes battoides bernardino Barnes & McDunnough, 1916, *Contr. nat. hist. Lepid. North America* 3 (2): 116, pl.11, figs.9, 11, 13; Comstock, 1927, *Butterflies California*: 192, pl.55, figs.29-31; McDunnough, 1938, *Mem. so. Calif. acad. sci.* 1: 28; Mattoni, 1954, *Bull. so. Calif. acad. sci.* 53: 164, pl.43, figs.1, 2.

Lycaena battoides var. *bernardino*, Holland, 1931, *Butterfly book*, rev. ed.: 265, pl.46, fig.37.

This Blue is well known to many southern California lepidopterists and has been in private collections and museums for many years. A description here seems unnecessary, other than to refer the reader to the illustration (Fig. 5A) and to Comstock (1927), where it is shown in color. This insect was originally described from Camp Baldy, San Bernardino Mts., California (Barnes & McDunnough, 1916), from which the name was derived.

Genitalic preparations of male specimens taken in central California (Monterey County) were made, and these have valvae that are deeply bifurcate (Fig. 1). This clearly shows that these specimens are in the *battoides* group. Preparations were also made of specimens from southern California (San Diego County), and they appear to be indistinguishable.

Variation: Based on 26 specimens from central California, there appears to be very little variation. Monterey County specimens have about the same size variation as specimens from numerous southern California localities. However, the specimens are consistently smaller than the average size of the other entities of *Philotes* in central coastal California.

Male: Forewing, average 10.02 mm. (9.2 - 10.6). Marginal fuscous band on upperside of forewing consistently wide (about 1.0 mm.). There is some variation on the upperside of the hindwing, some specimens having prominent interneural spots distinct from the marginal band. There is also a tendency for the aurora to show through in a few specimens.

Female: Forewing, average 9.54 mm. (8.5 - 10.8). The most noticeable variation is in the aurora on the upperside of the hindwing. It varies from a solid orange band 2 mm. wide in one specimen to a narrow, scalloped band in others. Most specimens are between these extremes, having distinct aurorae of the typical "*bernardino* - type" as shown in Fig. 5 A.

Distribution: COMSTOCK (1927) stated that this southern race of *P. battoides* has its home in the Sierra Madre, San Gabriel, San Bernardino, and San Jacinto Mountains of southern California. MATTONI (1954) expanded this distribution considerably; in the synoptic list at the end of the article he notes *bernardino* in California from the southern Sierras and western Mojave Desert to the coast, and in Baja California south to Cedros Island. RINDGE (1948) recorded *P. battoides* from Baja California and stated: "The Mexican specimens, especially the ones from Cedros Island, are of quite a different appearance beneath than typical *battoides*, and may constitute a new geographical

race of that species." However, MATTONI called these *bernardino*, and specimens that I have examined from the coastal foothills and as high as 3500' in the Sierra San Pedro Martir are *bernardino*. These have been published as such by PATTERSON and POWELL (1959), along with complete locality data.

Within the area treated in the present study, *P. bernardino* has been found in only three localities. The northern records are indicated by squares on the map (Fig. 6). Records and actual specimens examined (where numbers appear) are as follows:

MONTEREY Co.: Arroyo Seco, V-22-1955, "common" (J. W. TILDEN), V-22-1955, 1 ♂, 1 ♀ (TILDEN - CAS), VI-II-1960, 1 ♀ (R. L. LANGSTON); Arroyo Seco, 4 mi. E., VI-II-1960, 15 ♂, 8 ♀♀ (LANGSTON).

SAN BENITO Co.: Flats east of Pinnacles Natl. Mon., V-16-1954, 1 ♂ (TILDEN), "At Pinnacles National Monument . . . [Ray] Stanford reports . . . *Philotes battoides* common." — quoted from THORNE (1962).

Host plants: *Philotes battoides* and all of its subspecies are found in association with various types of *Eriogonum*. *P. battoides bernardino* is most closely associated with *E. fasciculatum* and its subspecies *foliolosum* throughout the greater part of its range. *E. fasciculatum foliolosum* is one of the most abundant wild buckwheats throughout cismontane southern California. In many places this woody shrub occurs in very dense stands, and may be the dominant form of chaparral slopes. This *Eriogonum* becomes sparse, and is found in only a few favored canyons at the northern limits of its distribution in Monterey County and the Mt. Hamilton Range. The specimens I took at Arroyo Seco were on *E. fasciculatum foliolosum*¹, and I have found this plant at the Pinnacles.

For several seasons a search was made on *E. fasciculatum polifolium* in Solano County and no *P. battoides bernardino* were found. Its absence here is more likely due to the isolation of this food-plant from the more southerly areas of this insect's known range, rather than its unsuitability as a host.

Associated Lycaenidae & Riodinidae: In Monterey County the *Eriogonum* was highly attractive to *Plebejus acmon* (Westwood & Hewitson), which was flying in close association with *bernardino*. In many areas collected in southern California, *P. acmon* would often be present, along with *Apodemia mormo virgulti* (Behr) or *A. mormo deserti* Barnes & McDunnough, depending on locality.

¹Throughout this paper, the associated plants were determined from samples that I collected at the respective localities where Blues were taken by myself. Records from other collectors are not as well documented and may or may not be the same host. In most cases, the plants would probably be the same, as I have duplicated many of the general areas of the other collectors.

Synopsis: The bifurcate valvae of the male genitalia indicate this entity to be a subspecies of *P. battoides* in central California. This subspecies may be distinguished from all others in the Coast Ranges by a combination of the following characteristics: 1) the consistently wide marginal bands on upperside of both wings of male, and bold, distinct aurorae on upperside of hindwings of female; 2) the distinct black terminal line on the underside of both wings; 3) the unicolorous dark fringes on the forewings with little or no tendency for checkering; 4) male genitalia with deeply bifurcate valvae; 5) associated with shrub-type *Eriogonum*; 6) adults appear in the spring as opposed to the geographically nearest allopatric subspecies of *P. enoptes* being on the wing in the summer.

Philotes enoptes smithi Mattoni

Philotes enoptes smithi Mattoni, 1954, *Bull. so. Calif. acad. sci.* 53: 160, pl.43, figs.8, 9.

This subspecies was described by MATTONI (1954) from series collected in 1948 by him and the late CLAUDE I. SMITH, for whom this insect was named. Except for comments under "variation" below, the reader is referred to Fig. 5 B, plus the original description and its accompanying photograph.

Genitalic preparations of male specimens from the north, middle, and south localities of this insect's known range were made. All of these have valvae that are entire and subquadrate. This confirms the findings of MATTONI, placing this subspecies in the *P. enoptes* complex.

Variation: Based on 72 specimens collected from five distinct localities since the original description, plus 22 paratypes that I examined at the LACM, there is considerable variation in this subspecies. There is noticeable size variation between different populations, and there is more variation in the maculation than any other entity of *Philotes* in central coastal California. The cilia of the inner margin of the hindwing, and the abdominal hairs as noted by MATTONI will not be emphasized here or in the synopsis, because, although it is a good character for fresh individuals, the hairiness is lost or becomes not very noticeable in worn specimens, which were necessary for a complete study.

Male: Forewing, average 11.08 mm. (9.2 - 12.9). The size averaged smaller for specimens from the northern end of the range (10.56 mm.). However, size is not a good criterion, as specimens taken at the exact spot (*e.g.* holotype and paratype localities) may be considerably smaller (or larger) in different seasons. Marginal band on forewing usually at least 1 mm. wide, but in the hindwing it varies from a solid band to a

dissociation into interneural macules. There is a tendency for the aurora to appear on the upperside of the hindwing, with red scales present in a few specimens from the north end of the range, and quite extensive red-scaling present in several specimens from the south end of the range. On the underside they consistently have large, prominent macules on a light grey ground color.

Female: Forewing, average 11.23 mm. (10.1-12.6). Variation in size parallels the male in relation to parts of the range and different seasons. In agreement with MATTONI, the upperside of the hindwings have aurorae that are quite variable, in color from orange to red, in extent from M_2 to A as a solid band, down to a few dissociated interneural spots.

Distribution: In the original description (Mattoni, 1955) all of the paratypes were collected in Monterey County, and it was stated that *P. enoptes smithi* is apparently endemic to the Santa Lucia Mountains of central California. Additional records by several collectors, while adding a few new localities, have not extended the range either inland or to the south, and only slightly to the north. The known distribution of this insect is indicated by open circles on the map (Fig. 6). Subsequent records, some duplicating the holotype and paratype localities, are as follows:

MONTEREY Co.: Burns Creek, State Hwy. 1, VIII-20-1948, 1 ♂, 1 ♀ (C. I. SMITH - CIS), VIII-21-1954, "common," VIII-13-1955, "common" (TILDEN), VIII-28-1961, 1 ♂, 2 ♀♀ (LANGSTON) (*topotypes*); ½ mi. north of Dolan Creek, State Hwy. 1, VIII-28-1961, 7 ♂, 3 ♀♀ (LANGSTON & J. A. POWELL), VIII-24-1962, 1 ♀ (LANGSTON) (one of paratype localities); Lucia, 3 mi. S. E., VIII-6-1956, 6 ♂, 3 ♀♀ (LANGSTON); Marina Beach, dunes, VIII-24-1962, 2 ♀♀ (LANGSTON); Seaside, dunes, VII-4-1959, 9 ♂♂, 18 ♀♀ (POWELL & J. A. CHEMSAK), VIII-24-1962, 6 ♂♂, 12 ♀♀ (LANGSTON).

Three more open circles appear on the map denoting distribution as given by MATTONI (1955) that are not indicated by the detailed records above. From north to south these are Monterey, Paraiso Springs, and 4 mi. north of Gorda.

Host plants: *Philotes enoptes* and all of its subspecies are found in association with various types of *Eriogonum*. In the middle and southern parts of the range of *P. enoptes smithi*, I collected it exclusively on *Eriogonum parvifolium*. This plant is a shrub-type of buckwheat occurring in good stands on the cliffs and road-cuts along the immediate coast. In the dunes areas at the north end of this insect's known range, I also

collected it on *E. parvifolium*. However, on the dunes, the adults were also attracted to the flowers of *E. latifolium*. The latter is herbaceous and leafy only at the base. In areas to the north in Monterey and Santa Cruz Counties where *E. latifolium* was found in abundance in the absence of *E. parvifolium*, this Blue was not found.

Associated Lycaenidae & Riodinidae: In the middle and southern parts of its range, *P. enoptes smithi* was flying in association with *Plebejus acmon*. In the northern dunes areas it was also with *P. acmon* along with heavy, peak flights of *Apodemia mormo mormo* (Felder & Felder).

Synopsis: The entire, subquadrate valvae of the male genitalia indicate this entity to be a coastal subspecies of *P. enoptes* in central California. This subspecies may be distinguished from all others by a combination of the following characteristics: 1) the wide marginal band on upperside of forewings of male; 2) the faint terminal line on the underside of both wings; 3) the prominent checkering of the forewing fringe on both upper and under surfaces; 4) a light underside with large, prominent macules; 5) associated with shrub-type *Eriogonum* in the fog-belt of the immediate coast; 6) adults appear in the summer as opposed to the geographically nearest allopatric *Philotes* being on the wing in the spring.

PHILOTES ENOPTES BAYENSIS Langston, NEW SUBSPECIES

Male: Upper surface: Forewing: length 11.6 mm.; overlaid scales iridescent blue; marginal band narrow, 0.33 mm. in width; fringes white with well developed fuscous areas at vein ends, resulting in pronounced checkering, marginal length of fuscous and white of equal alternate distribution; basal area with blue and white ciliae. Hindwing: overlaid scales iridescent blue extending from above cell and R to A₂; anterior margin with fuscous extending only half way to cell and above R vein; marginal band narrow, 0.25 mm. wide; roundish interneural spots distinct from marginal band, extending from M₁ to A₁; fringes continuously white with no checkering; no trace of aurora; cilia of inner margin predominately black, intermixed with some white, up to 1 mm. in length; basal area with long, white ciliae.

Under surface: Forewing: ground light grey; all macules distinct as little suffusion, even in basal area; two small basal macules; fringes as upper surface, delineated by narrow terminal line. Hindwing: Ground light grey; macules small, but distinct as little suffusion, even in basal area; fringes white with slightly developed fuscous areas at vein ends, resulting in moderate checkering; aurora orange, well developed with cusps filling interneural areas between M¹ and A¹; cilia of inner margin and basal area white, dense, up to 1 mm. long.

Abdomen: densely covered with long, white hairscales above and short, white hairscales below; genitalia (from paratypes and topotypes) of the *P. enoptes* conformation; valvae entire and subquadrate with 21 discernable spines; processes of fultura inferior curved at tips; paired arms of gnathos slender, terminating in slightly curved points.

Female: Upper surface: Forewing: length 11.2 mm.; ground dark brown; underside macule at end of cell definable from ground; fringes checkered as in male; basal area with blue and white ciliae. Hindwing: ground dark brown; aurora orange, extending from M_2 to A_1 as contiguous spots forming almost a solid appearance; fringes white with no checkering; cilia of inner margin as in male; basal area with scattered blue scales and long, white ciliae. Under surface: ground with faint buff tinge, rather than pure grey; maculation as in male, except for faint aurora extending to Cu of forewing. Abdomen: sparsely covered with brown hairscales above and short, white hairscales below.

HOLOTYPE male and ALLOTYPE female: China Camp, near Point San Pedro, Marin County, California, June 17, 1961 (R. L. LANGSTON); deposited in the California Academy of Sciences. 235 PARATYPES: listed under "Distribution"; their deposition is given at the conclusion of this paper.

The type specimens were chosen as being the most typical in color and wing pattern. The locality for the types was chosen because it is close to the center of the known distribution, with populations to the south, east, and northwest. In addition this locality appears to support a good, strong colony with the earliest specimen taken in 1958, and good series secured in 1961 and 1962. The subspecies was named for San Francisco Bay, the largest bay on the west coast of North America (Puget is called a "Sound"). The greatest numbers of individuals and known colonies are in immediate proximity to San Francisco Bay, the insects being found on steep embankments, bluffs or road-cuts close to the water.

Variation: Based on 237 specimens collected from ten distinct localities, there is very little variation. Except for occasional dwarfs and giants that give a spread to the minimum-maximum figures, the size is fairly uniform. Most individuals measured close to the average figure. By observation, no noticeable difference was noted in size between widely scattered populations. Forewing measurements were made for each population; these were combined for brevity by counties and averaged: Contra Costa Co., ♂ 11.11 mm. (8.8-12.1), ♀ 10.51 mm. (9.0-13.2); Marin Co., ♂ 11.20 mm. (9.5-12.2), ♀ 11.15 mm. (10.5-11.6); Solano Co., ♂ 10.43 mm. (10.0-10.9), ♀ 10.76 mm. (9.8-11.8); Sonoma Co., ♂ 11.33 mm. (9.8-12.0), ♀ 10.79 mm. (9.8-12.8). The extremes in size are shown in Fig. 5 D, upper. The average figures show very little variation (10.43 min. to 11.33 max.), less than one millimeter either by population or by sex. There is also much less variation in maculation than the previous subspecies treated.

Male: Forewing, average 11.12 mm. (8.8-12.2). The marginal band on the upperside of both wings has a tendency to become narrower and

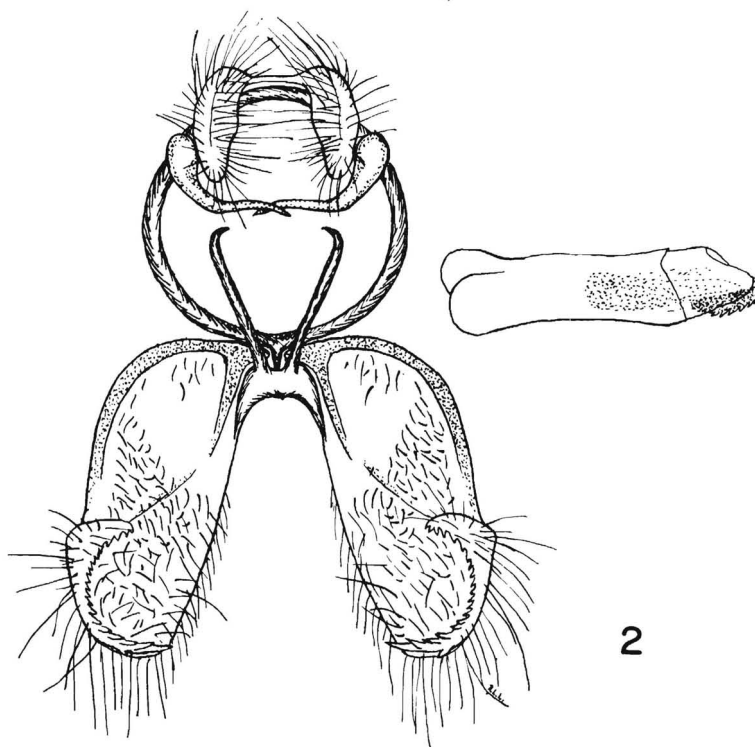
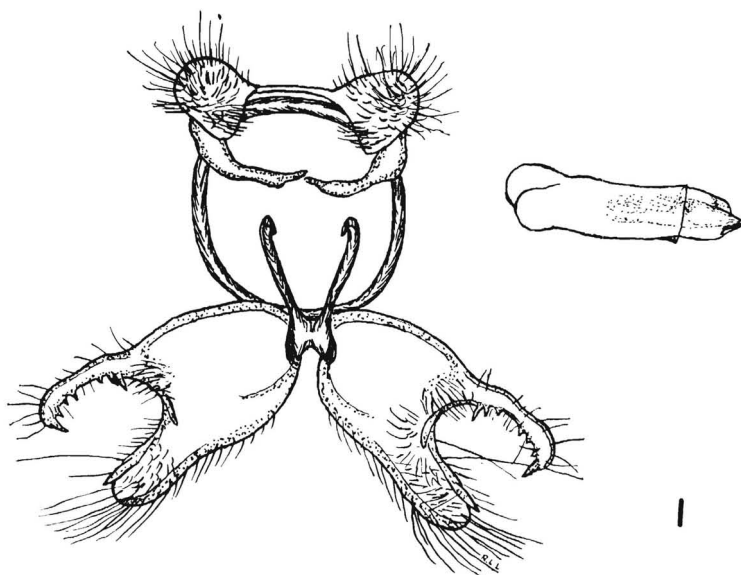


Fig.1. ♂ genitalia of *Philotes battoides bernardino*, with aedeagus removed and shown at right.

Fig.2. ♂ genitalia of *Philotes enoptes bayensis*, with aedeagus removed and shown at right.

less distinct than on the holotype. The interneural spots on the hindwing are also reduced in some specimens (Fig. 5 D, lower), with complete absence in four specimens each from the type locality and Contra Costa County. In worn or rubbed specimens a brownish ground color becomes evident where the blue overlay is lost, and the aurora may show through, but in no case were red or orange scales actually present on the upper-side. On the underside some specimens had slightly heavier maculation, others definitely lighter maculation than the holotype. The aurorae varied from a definite red to dull orange.

Female: Forewing, average 10.77 mm. (9.0 - 13.2). The most variation is in the aurora on the upperside of the hindwing, from a distinct solid band extending from R to A₁ in one specimen (Fig. 5 D, lower) to a reduction to two or three dissociated spots in others. The majority had aurorae of about the extent of the allotype. The variation of the underside parallels that of the male.

Distribution: This insect occurs quite commonly in distinct colonies around the northern and eastern periphery of San Francisco Bay and into northwestern Sonoma County. The earliest known specimens were taken at Tiburon, Marin County, in 1939. However, in recent years split-level suburbia has built up so extensively on the Tiburon Peninsula, that the host plant has become almost non-existent. In four different seasons I was able to secure only 16 specimens. The known distribution of this insect is indicated by solid circles on the map (Fig. 6), and is listed below, all specimens being designated as PARATYPES:

CONTRA COSTA Co.: Point San Pablo, Richmond, V-30-1963, 4 ♂, 4 ♀♀, VI-16-1962, 11 ♂♂, 5 ♀♀, Point Richmond, VI-16-1962, 14 ♂♂, 14 ♀♀, VI-24-1962, 23 ♂♂, 10 ♀♀, VII-4-1962, 6 ♂♂, 15 ♀♀ (all LANGSTON).

MARIN Co.: China Camp, near Point San Pedro, VI-8-1958, 1 ♀, VI-17-1961, 15 ♂♂, 4 ♀♀, VI-9-1962, 13 ♂♂, 8 ♀♀ (LANGSTON — "topoparatypes"); Paradise Cay, 4 mi. E. of Corte Madera, V-29-1960, 2 ♂♂, 1 ♀ (LANGSTON); Tiburon, VI-4-1939, 2 ♂♂ (L. I. HEWES — CAS); Tiburon, 2 mi. N. E., V-28-1958, 1 ♀, VI-9-1962, 1 ♂ (LANGSTON); hill above Tiburon, VI-4-1963, 9 ♂♂, 5 ♀♀ (LANGSTON).

SOLANO Co.: Carquinez Strait at Glen Cove, VI-2-1962, 4 ♂♂, 8 ♀♀ (LANGSTON); Glen Cove, VI-8-1963, 1 ♂, 10 ♀♀ (LANGSTON).

SONOMA Co.: Duncans Mills, 2 mi. E., VII-9-1959, 2 ♂♂, 4 ♀♀, VII-15-1959, 1 ♀, VII-7-1962, 3 ♂♂, 3 ♀♀; Forestville, 3 mi. W., VII-7-1962, 1 ♂, 1 ♀, VII-14-1962, 2 ♂♂, 4 ♀♀; Graton, 3 mi. W., VII-14-1962, 5 ♀♀; Occidental, 2 mi. W., VII-14-1962, 6 ♂♂, 12 ♀♀ (all LANGSTON).

Host plants: In Contra Costa and Solano Counties this insect was taken on *Eriogonum latifolium auriculatum*. In Marin and Sonoma Counties it was on *E. latifolium nudum*. Both of these plants have white flowers, and are of the herbaceous-type, being leafy only at the base with bare (nude) flowering stems. This insect does not appear to stray very far from these plants, and none were found utilizing any other flowers for nectar. When these blues are scared up or missed, they will immediately fly to the closest *Eriogonum*, even against a strong wind. On cool, overcast, or windy days (where small numbers appear in the paratype records) occasional individuals were found resting in the flowering heads of the *Eriogonum*. Within the range of this insect where shrub-type buckwheat was found (*E. fasciculatum polifolium*), there was no trace of this subspecies. However, the shrub was found slightly inland, rather than in immediate proximity to the bay.

Associated Lycaenidae: If the conditions were right for the actual flying of *P. enoptes bayensis* (e. g. warm, no fog, absence of strong wind), *Plebejus acmon* was present in every locality, and usually in considerably greater numbers. Attracted to the *Eriogonum* in smaller numbers were several other lycaenids that fly in late spring and early summer: *Strymon melinus* Hübner, *Lycaena gorgon* (Boisduval), *L. xanthoides* (Boisduval), and occasionally *Celastrina argiolus echo* (Edwards).

Synopsis: The entire, subquadrate valvae of the male genitalia indicate this entity to be a coastal subspecies of *P. enoptes* in northern California. This subspecies may be distinguished from all others by a combination of the following characteristics: 1) the narrow marginal band on upperside of both wings of male; 2) the extension of blue into subcostal area on hindwing of male; 3) the prominent checkering of the forewing fringe on both upper and under surfaces; 4) a light underside with small, but distinct macules; 5) associated with white-flowered herbaceous-type *Eriogonum* in the coastal fog-belt; 6) adults appear in spring and early summer as opposed to the geographically nearest allopatric subspecies of *P. enoptes* being on the wing in late summer.

PHILOTES ENOPTES TILDENI Langston, NEW SUBSPECIES

Male: Upper surface: Forewing: length 10.8 mm.; overlaid scales, iridescent blue; marginal band wide, 0.80 mm., uniform, slight intrusion of blue along veins; fringes white with fuscous areas at vein ends, resulting in moderate checkering, marginal length of fuscous and white of equal alternate distribution; basal area with white ciliae. Hindwing: overlaid scales iridescent blue extending from cell and M_1 to A_2 ; anterior margin above M_1 fuscous, but a few scattered blue scales above cell; marginal band wide, over 1 mm., intrusion of blue along veins resulting in

scalloped appearance basally; fringes continuously white with no checkering; slight indication of aurora, but no actual orange scales present; cilia of inner margin white, sparse, up to 0.75 mm. in length; basal area with long, white ciliae.

Under surface: Forewing: ground light grey; macules relatively large and distinct, with some suffusion in anal and basal areas; a single, fused basal macule; fringes as upper surface, delineated by narrow terminal line. Hindwing: ground light grey;; macules distinct, with some suffusion of basal melanin; fringes white, almost uniform, but with very slight fuscous areas at vein ends; aurora dull orange, well developed with cusps filling interneural areas between M_1 and A_1 ; cilia of inner margin and basal area white, up to 1 mm. long. Abdomen: sparsely covered with white hairscales above, and short, white hairscales below; genitalia (from a topo-paratype) of the *P. enoptes* conformation; valvae entire and subquadrate with 21 discernible spines; processes of fultura inferior sharply curved at tips; paired arms of gnathos slender, terminating in spatulate points.

Female: Upper surface: Forewing: length 11.2 mm.; ground dark brown; underside macule at end of cell definable from ground; fringes checkered as in male; basal area with white ciliae. Hindwing: ground dark brown; aurora dull orange, extending from M_1 to A_1 with solid band appearance; fringes white with no checkering; cilia of inner margin as in male; basal area with dark brown to black scales and long, white ciliae. Under surface: ground as males, but with faint buff tinge; macules large and prominent, especially discoidal macule and basal macule of forewing; aurora extending to Cu of forewing. Abdomen: Sparsely covered with brown hairscales above and short, white hairscales below.

HOLOTYPE male: Del Puerto Canyon, 22 mi. W. of Patterson, Stanislaus County, California, August 11, 1962 (R. L. LANGSTON), and ALLOTYPE female: same locality, August 21, 1962 (J. A. POWELL); deposited in the California Academy of Sciences. 16 PARATYPES: listed under "Distribution", and their deposition at the conclusion of this paper.

The type specimens were chosen as being the most typical in color and wing pattern. The locality for the types was chosen because it is close to the center of the known distribution, with populations to the east, southwest, west and northwest. In addition, this locality appears to support the strongest colony yet found, with more specimens taken than all others combined. The subspecies was named for Dr. J. W. TILDEN, who collected the first known specimens, and who furnished information that gave an indication of the type of environment where subsequent surveys could be made.

Variation: Based on only 18 specimens from five relatively close localities, variation may be expected to be greater than stated here when more specimens become available for study.

Male: Forewing, average 11.06 mm. (9.8 - 11.8). The marginal band on the upperside of both wings has a tendency to become slightly wider or narrower than on the holotype. On the hindwing, dissociated interneural spots appeared on two specimens, a slight indication of aurora on three specimens, none in the remainder. On the underside most

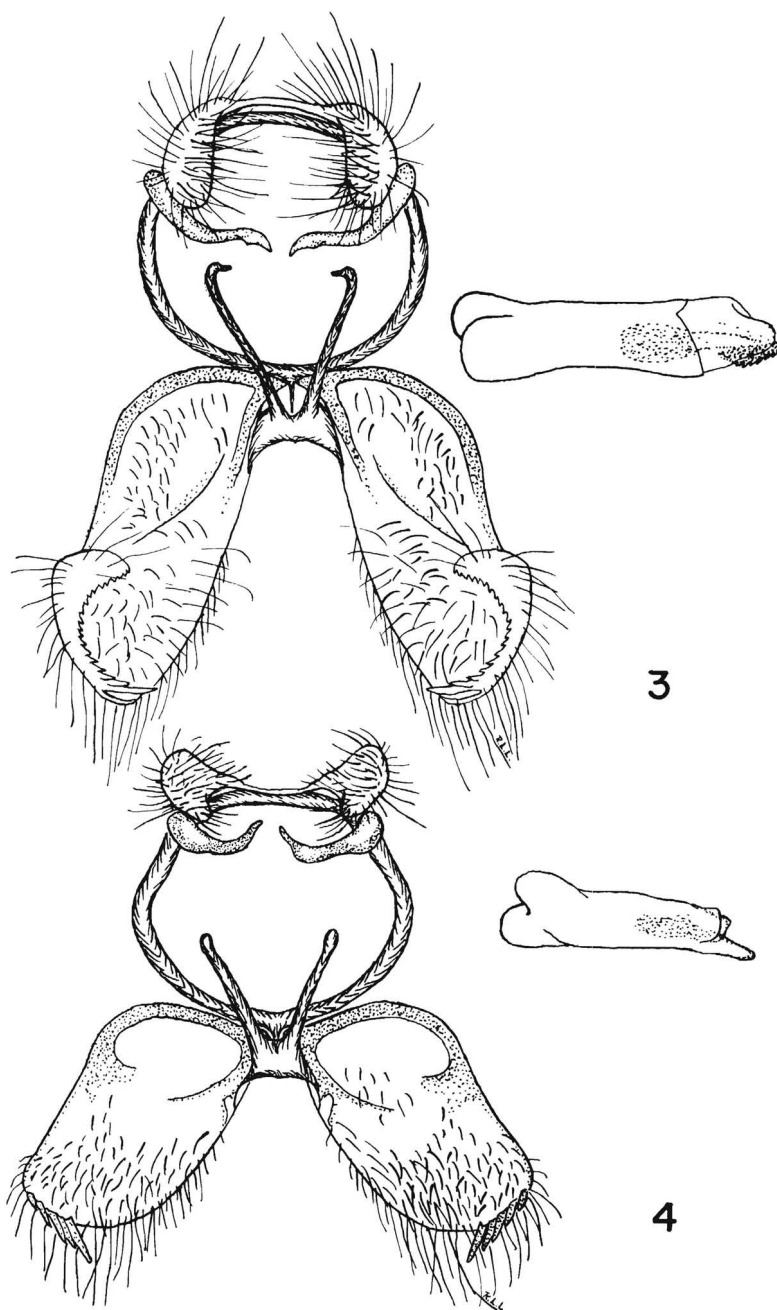


Fig.3. ♂ genitalia of *Philotes enoptes tildeni*, with aedeagus removed and shown at right.

Fig.4. ♂ genitalia of *Philotes sonorensis*, with aedeagus removed and shown at right.

specimens had heavier maculation and a greater suffusion of basal melanin scales than the holotype. Aurorae vary from dull red to light orange, depending on the freshness of the specimens.

Female: Forewing, average 10.66 mm. (9.8 - 11.6). The most variation is in the aurora on the upperside of the hindwing. It varies in extent from M_1 (max.) or Cu_1 to A_1 but always with a solid-band appearance. The color of the aurora varies from dull orange to pale yellow, depending on freshness of the specimens. On the underside, some specimens have heavier maculation, others slightly lighter maculation than the allotype.

Distribution: At present, this Blue is known to occur only in the eastern part of the Mt. Hamilton Range of central California. It was found primarily above 2000 ft. in the digger pine belt. The known distribution of this insect is indicated by divided circles on the map (Fig. 6), and is listed below, all specimens being designated as PARATYPES:

SANTA CLARA Co.: Arroyo Bayo, E. base of Mt. Hamilton. IX-8-1953, 1 ♂, IX-12-1954, 1 ♀ (TILDEN); San Antonio Valley, E. of Mt. Hamilton, IX-11-1955, 1 ♀, VIII-25-1956, 1 ♂ (TILDEN); San Antonio Valley, 3.5 mi. N. of Patterson Rd. Jct., VIII-21-1962, 1 ♀ (POWELL).

STANISLAUS Co.: Del Puerto Canyon, 18 mi. W. of Patterson, VIII-11-1962, 1 ♂, IX-6-1962, 1 ♂ (LANGSTON); Del Puerto Canyon, 22 mi. W. of Patterson, VIII-21-1962, 3 ♂♂, 2 ♀♀, IX-6-1962, 3 ♂♂, 1 ♀ (LANGSTON & POWELL — "topo-paratypes").

Host plants: This insect was taken on *Eriogonum latifolium* (?) *auriculatum* and (?) *nudum*. This plant does not exactly fit the known varietal concepts, with the two questionable subspecies names being applied to plants from different localities. These plants appear the same to me. They have bright yellow flowers, and are of the herbaceous-type, being leafy only at the base with bare (nude) flowering stems.

Associated Lycaenidae & Riodinidae: At every locality where *Philotes enoptes tildenii* was found, *Plebejus acmon* was present in greater numbers. Being quite scarce, this *Philotes* is very difficult to find when there may be several dozen *P. acmon* congregated and flying around the same flowers. Attracted to the *Eriogonum* in most of the localities were good numbers of *Apodemia mormo mormo*, an occasional *Strymon melinus*, and a single *Atlides halesus* (Cramer).

Synopsis: The entire, subquadrate valvae of the male genitalia indicate this entity to be an inner coast range subspecies of *P. enoptes* in central California. This subspecies may be distinguished from all others by a combination of the following characteristics: 1) the wide

marginal band on upperside of forewing of male; 2) fuscous in subcostal area of hindwing of male, resulting in reduced amount of blue; 3) checkering of the forewing fringe on both upper and under surfaces; 4) slightly suffused underside with proportionately large macules; 5) associated with yellow-flowered herbaceous-type *Eriogonum* in the hot, interior coast range; 6) adults appear in late summer as opposed to the geographically nearest allopatric *Philotes* being on the wing in spring and very early summer.

Philotes sonorensis (Felder & Felder)

Lycaena sonorensis Felder & Felder, 1865, *Reise Fregatte Novara, Lep.* 2 (2): 281, pl.35, figs.3, 4; Strecker, 1875, *Lep., Rhop.-Het.*: 105; Strecker, 1878, *Butterflies & Moths N. Am.*: 96; Wright, 1906, *Butterflies West Coast*: 223, pl.29, figs.374, b, c; Draudt in Seitz, 1924, *Macrolep. world* 5: 816, pl.144e, 3 figs.; Holland, 1931, *Butterfly book*, rev. ed.: 268, pl.31, figs.21, 22, pl.66, fig.45.

Lycaena regia Boisduval, 1868, *Ann. soc. ent. Belg.* 12 (2): 46; Strecker, 1874, *Lep., Rhop.-Het.*: 87; Edwards, 1875, *Butterflies N. Am.* 2 (3): 311, pl.49, figs.1-4; Strecker, 1878, *Butterflies & moths N. Am.*: 96 (places *regia* as synonym of *sonorensis*).

Philotes regia, Scudder, 1876, *Bull. Buffalo soc. nat. sci.* 3: 116 (designates *regia* as generotype of *Philotes*).

Philotes sonorensis, Dyar, 1902, *Bull. U. S. nat. mus.* 52: 43; Comstock, 1927, *Butterflies California*: 194, pl.56, figs.7-9; McDunnough, 1938, *Mem. so. Calif. acad. sci.* 1: 28; Mattoni, 1954, *Bull. so. Calif. acad. sci.* 53: 165; Downey in Ehrlich, 1961, *How to know the butterflies*: 237, fig.456.

This Blue is familiar to many lepidopterists, and even to general collectors specializing in other orders, as it is one of the most gaudily colored of the California Blues. The brilliant iridescence of the blue color, the arrangement of the prominent red splotches and the pattern of the black markings are completely unlike any other Blue in North America. A description here is not needed as it can easily be recognized from the illustration (Fig. 5F), and in Comstock (1927), where both sexes of *P. sonorensis* plus two named forms are shown in color.

The male genitalia (Fig. 4) differ markedly from both the *P. battoides* complex and the *P. enoptes* complex, as would be expected. In general appearance, the valvae come closer to the general shape of those of *P. enoptes*, being entire and quadrate. However, the valvae are proportionately shorter and exhibit only five well-developed spines.

Variation: With only small series collected and examined from central California, there appears to be very little variation. Some of the northern specimens tended to be slightly larger in size than the average southern California examples. A small female from southern California is illustrated in Fig. 5 F for comparison. However, any size difference may be an

artifact of the small samples from the north. Larger than "normal" specimens have also been taken in the western edge of the Colorado Desert in San Diego County. Several hundred *P. sonorensis* from southern California were examined at three museums (CAS, CIS, and LACM), plus those in my own collection. The only other variation noted is a "paler brilliance" in the shade of blue for the northern individuals. In a box containing several dozen *P. sonorensis*, the one or two individuals from the north can be easily "spotted."

Distribution: This Blue is an early spring flyer and occurs in isolated colonies due to the distribution of its food-plants. In southern California it becomes abundant in its favored localities, particularly lower canyons on both the coastal and desert sides. MATTONI (1954) gives its distribution in California as the Coast Ranges from Santa Clara to San Diego, and in Baja California to Ensenada. POWELL (1958) reports this insect from as far south as the vicinity of Punta Prieta. Data from museum specimens (CAS & CIS) show that in California *P. sonorensis* has also been taken in Imperial, Riverside, Mariposa, and Tuolumne Counties. Within the area of the present study it is considered a rare insect, having been taken only in small numbers at each of the known localities. The northern records of *P. sonorensis* are indicated by triangles on the map (Fig. 6), and are listed below:

MONTEREY Co.: Big Sur, V-4-1952, 2 ♀♀ (T. W. DAVIES).

SAN BENITO Co.: Pinnacles Natl. Mon., north road, III-31-1962, 1 ♂ (D. C. RENTZ — CAS).

SANTA CLARA Co.: Alum Rock Park, years from 1939 to 1956, earliest date II-7 to the latest date of III-16, 25 ♂♂, 5 ♀♀ (TILDEN), III-16-1940, 1 ♂, II-12-1955, 2 ♂♂ (TILDEN — CAS), III-7-1959, 5 ♂♂ (LANGSTON), III-12-1959, 1 ♀, III-12-1961, 2 ♂♂ (P. C. ENGELDER); Arroyo del Valle, E. base Mt. Hamilton, IV-15-1961, 1 ♂ (J. H. SCHOSANSKI), III-24-1962, 5 ♂♂, 2 ♀♀, III-31-1962, 3 ♂♂ (ENGELDER & SCHOSANSKI), IV-7-1962, 1 ♂ (SCHOSANSKI), IV-18-1962, 4 ♂♂ (D. ENGELDER).

STANISLAUS Co.: Adobe Creek, W. of Patterson, III-9-1956, 1 ♂ (D. BURDICK — CIS).

Life history: The early stages of *P. sonorensis* were briefly described by COMSTOCK (1927), and in much more detail by COMSTOCK and COOLIDGE (1930) where the egg, all five larval instars, and the pupa are very aptly treated. In the latter publication it is stated that the food-plants are the various species of *Sedum*. COMSTOCK and COOLIDGE continue: "The eggs are placed mainly on the undersurface of the leaves, but may also be deposited on the upper sides and even on the

stalks. The larvae feed on the contents of the thick, juicy leaves, sometimes crawling entirely within, but usually several of the posterior segments are left protruding. The apical portion of the leaves seems to be the preferred part, and even the stalk may be riddled. In moulting, the larvae withdraw from the leaves and descend usually to the under-surface. Pupation takes place in debris about, or at the base of the food-plant."

Host plants: It has been stated several places in the literature that *P. sonorensis* feeds on *Sedum* and/or various members of the Stonecrop family. Within the area of the present study, I collected it in association with *Dudleya cymosa setchellii*. To the north of the triangles on the map (Fig. 6), from closely adjacent to up to 150 miles, various types of Stonecrop were found, mostly on rocky outcroppings. The primary ones investigated were *Dudleya farinosa* and *D. caespitosa*; no *P. sonorensis* were found. Their not being found associated with these plants is based on several seasons of spring collecting from 1953 to the present.

Associated Lycaenidae: No direct, close association was noted, as was the case of the other *Philotes*. In the general vicinity were such early spring fliers as *Plebejus acmon cottlei* Grinnell and *Glaucopsyche lygdamus behrii* (Edwards).

Synopsis: Records from several collectors and specimens on deposit in museums indicate the occurrence of *P. sonorensis* in central California. This species may be distinguished from all others by a combination of the following characteristics: 1) completely different wing pattern on both upper and under surfaces; 2) different shades of wing colors on both upper and under surfaces; 3) prominent checkering of wing fringes on both upper and under surfaces — similarity to the *P. enoptes* group; 4) male genitalia with quadrate, five-spined valvae; 5) the larvae feed

Upper: A. *P. battoides bernardino*: uppersides, ♂ & ♀. Arroyo Seco, 4 mi. E., Monterey Co., Calif., VI-11-1960, R. L. LANGSTON collector. B. *P. enoptes smithi*: uppersides, ♂ & ♀. Dolan Creek, State Hwy. 1, Monterey Co., Calif., VIII-28-1961, R. L. LANGSTON collector. C. *P. enoptes bayensis*: uppersides, Holotype ♂ & Allotype ♀. Marin Co., Calif. D. *P. enoptes bayensis*: uppersides, ♂ & ♀. Paratypes from Contra Costa Co., Calif., to illustrate size variation within a single population. E. *P. enoptes tildeni*: uppersides, Holotype ♂ & Allotype ♀. Stanislaus Co., Calif. F. *P. sonorensis*: uppersides, ♂, Alum Rock Park, Santa Clara Co., Calif., III-7-1959, R. L. LANGSTON collector; ♀, National City, San Diego Co., Calif., II-24-1951, R. L. LANGSTON collector.

Lower: A, B, C, E, F. Undersides of the same specimens as figured h · uppersides, with their corresponding letters. D. *Philotes enoptes bayensis*: uppersides, ♂ & ♀. Paratypes from Solano Co., Calif., to illustrate reduced border and spots in male, and increased orange aurora in female.

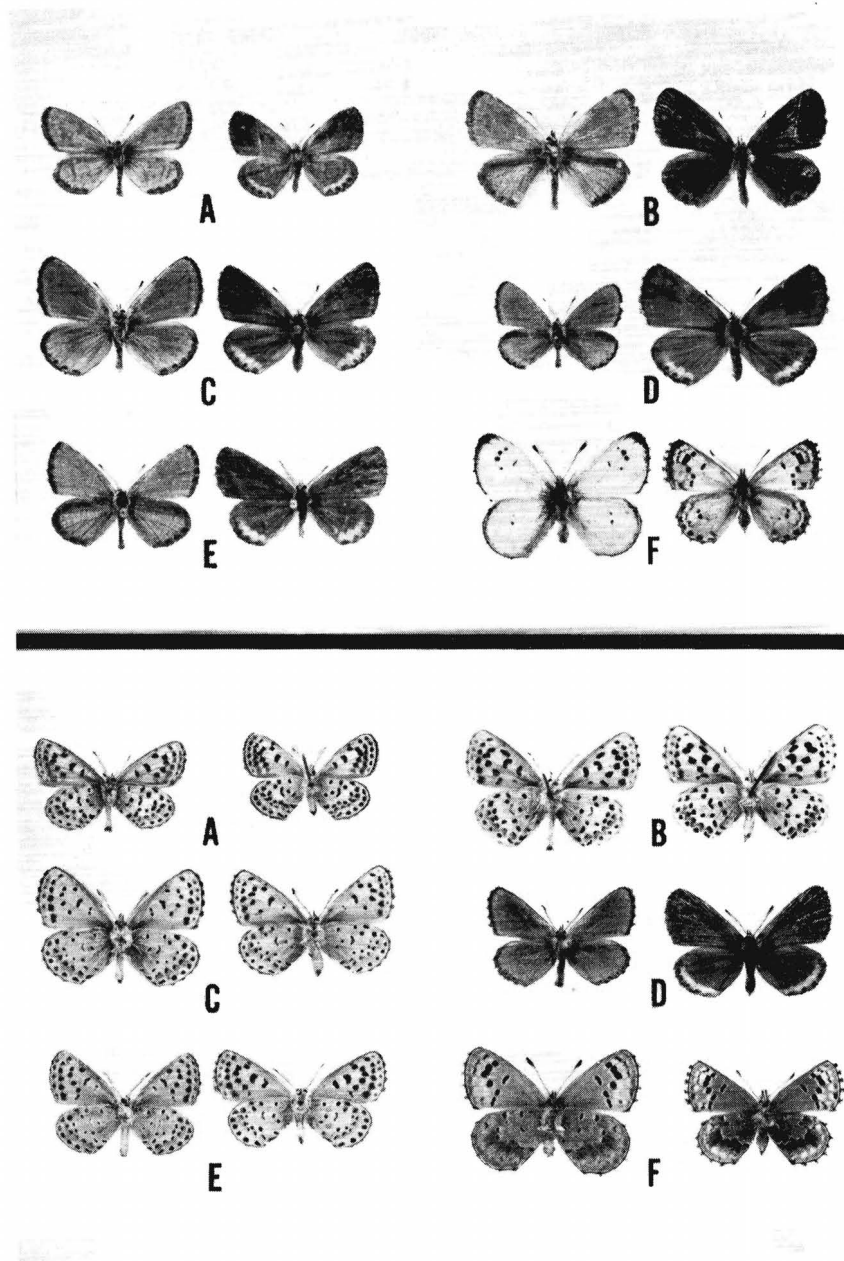


Fig.5. Adult *Philotes*, natural size. Each letter denotes a pair, with the ♂ at the left, and the ♀ at the right. (Detailed caption on page 218.)

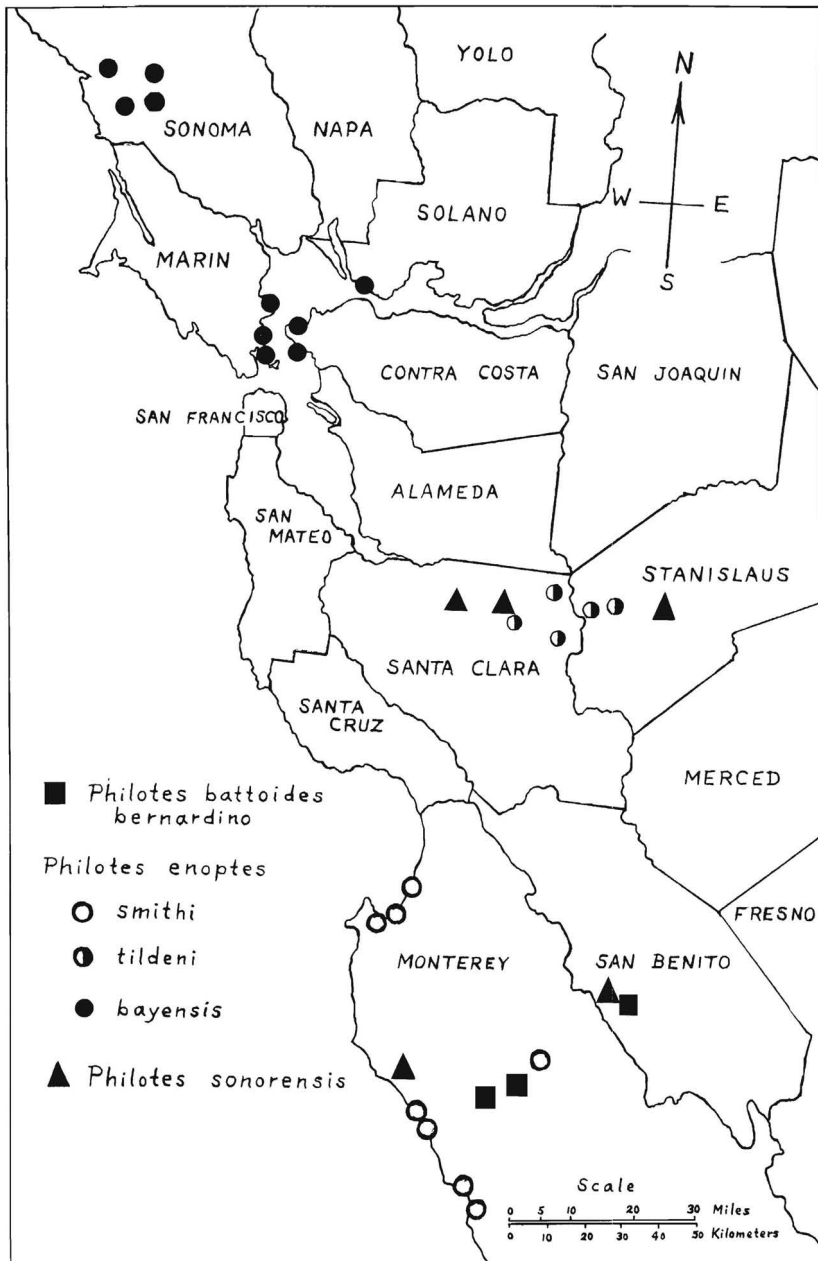


Fig.6. County map of central coastal California. Symbols indicate localities as follows: squares = northern records of *P. battoides bernardino*; open circles = known distribution of *P. enoptes smithi*; divided circles = known distribution of *P. enoptes tildeni*; closed circles = known distribution of *P. enoptes bayensis*; triangles = northern records of *P. sonorensis*.

on Stonecrop; 6) adults appear in early spring, with the flight season essentially over before any of the other *Philotes* are on the wing.

The ab. "sonoralba" Watson & W. P. Comstock, and the genetic form "comstocki" Gunder have not, as yet, been shown to occur in central California.

DISCUSSION

The *Philotes battoides* subspecies and all three subspecies of *P. enoptes* are allopatric to each other, being well separated geographically, as will be noted in Fig. 6. These entities plus *P. sonorensis* are also separated biologically, both by host plant and flight season. The geographical separation is based not only on where the various colonies are known to occur, but where they are presumably absent, since surveys were made in the intervening areas, between the known colonies.

Spring surveys during several seasons were made: 1) in coastal Marin and Sonoma Counties on *Eriogonum latifolium* and its subsp. *nudum*; 2) eastward in Contra Costa County to the Antioch dunes on *E. latifolium saxicola*; 3) northward in Napa and Solano Counties on *E. latifolium auriculatum*, *saxicola*, and *E. fasciculatum polifolium*; 4) southward in Alameda and San Mateo Counties on *auriculatum* and other herbaceous-type buckwheats.

Mid and late summer surveys included: 1) immediate costal Santa Cruz County on *E. latifolium*, and on its subsp. *auriculatum* in the mountains; 2) the Mt. Hamilton Range on *E. virgatum*, *E. wrightii trachygonum* and *E. fasciculatum foliolosum*; 3) southward into San Benito and Monterey Counties on *E. elongatum* and *auriculatum*; 4) northward through San Joaquin Co. on *auriculatum*, Contra Costa and Napa-Yolo Counties on *auriculatum* and *saxicola*, including the Antioch dunes for several seasons. Negative surveys on *Dudleya* and other stonecrops are noted under the *P. sonorensis* host plants.

There is a distinct possibility that *Philotes* could be discovered at any or all of these intervening areas if the timing is correct. These Blues have such a short flight-period in any one micro-environment that a difference of one or two weeks too early or too late could indicate their absence. The timing also varies in different years, especially in the spring if there are unseasonably late rains and extended cloudy, cool periods.

DEPOSITION OF MATERIAL

The genitalic preparations and their corresponding specimens are deposited in CAS (7 even-numbered slides), and CIS (8 odd numbers). The holotypes, allotypes, and other specimens appearing in the photo-

graphs are deposited in CAS. Paratypes and other specimens examined in this study (represented by the first figure under each entity below), are deposited as follows, with the remaining specimens in the collection of the author.

Philotes battoides bernardino — 26 specimens (Monterey Co.): 6 in CAS; 6 in CIS; 6 in LACM.

P. enoptes smithi — 72 specimens (Monterey Co.): 6 in CAS; 38 in CIS; 6 in LACM. (22 Mattoni paratypes previously on deposit in LACM.)

P. enoptes bayensis — 235 paratypes (Contra Costa, Marin, Solano & Sonoma Counties): 50 in CAS; 50 in CIS; 50 in LACM; 10 in the collection of J. W. TILDEN.

P. enoptes tildeni — 16 paratypes (Santa Clara & Stanislaus Counties): 2 in CAS; 4 in CIS; 2 in LACM; 4 plus one genitalia slide in the collection of J. W. TILDEN.

P. sonorensis — 10 specimens (San Benito, Santa Clara & Stanislaus Counties): 6 in CAS; 3 in CIS; 1 in LACM.

ACKNOWLEDGMENTS

In addition to making available the specimens in the California Insect Survey, University of California, Berkeley, much credit goes to Dr. J. A. POWELL for direct assistance in collecting, several independent late spring and summer surveys, plus suggestions and reading of this manuscript. Many thanks are due to Dr. J. W. TILDEN, San Jose, for the loan of material and critical records from his extensive field experience. I am greatly appreciative for the help of Mrs. MARGARET BERGSENG and Dr. HELEN SHARSMITH, Herbarium of the University of California, for the plant determinations in a very difficult group. I wish to acknowledge the helpful cooperation of the following in making available records and/or specimens of the private and institutional collections in their care: T. W. DAVIES, San Leandro; P. C. ENGELDER, San Jose; Dr. C. D. MACNEILL, California Academy of Sciences; L. M. MARTIN, Los Angeles County Museum; and J. H. SCHOSANSKI, Santa Clara.

SUMMARY

1. *Philotes battoides bernardino*, *P. enoptes smithi*, *P. enoptes bayensis*, *P. enoptes tildeni* and *P. sonorensis* are found in coastal California from the central areas to the North Coast Range.

2. Those subspecies in the *P. battoides* and *P. enoptes* groups occur in distinct colonies and are allopatric, being well separated geographically.

3. All of these *Philotes* can be distinguished from each other by a combination of morphology, host plants, and flight season.

4. The subspecies of *P. battoides* and *P. enoptes* are each associated with different types of *Eriogonum*, while the early stages of *P. sonorensis* are known to feed on *Dudleya* and *Sedum*.

5. The ubiquitous *Plebejus acmon* feeds on, and adults are attracted to the flowers of *Eriogonum*, thus making difficult the detection of most of the *Philotes*, which occur in lesser numbers and have a much shorter flight season.

6. The appearance of the adults of the *Eriogonum*-feeding *Philotes* is correlated with the early full-bloom of these plants, and hence they are often found flying in association with butterflies of the *Apodemia mormo* complex.

7. Some of these *Philotes* entities appear to barely eke out an existence in central California, with two of them (*bernardino* and *sonorensis*) occurring much more commonly to the south, ranging extensively throughout southern California and Baja California.

Literature Cited

- Barnes, W., & J. H. McDunnough, 1916. Notes on North American diurnal Lepidoptera. *Contr. nat. hist. Lepid. North America* 3(2): 53-156.
- Clench, H. K., 1961. Subfamily Lycaeninae. Blues, coppers, harvesters and hairstreaks. In Ehrlich, P. R., & Ann H. Ehrlich, *How to know the butterflies*: pp. 176-228. Wm. C. Brown Co., Dubuque, Iowa.
- Comstock, J. A., 1927. *Butterflies of California*. 334 pp., 63 pls. Author, Los Angeles, Calif.
- & C. Coolidge, 1930. The life history of *Philotes sonorensis* Felder. *Bull. so. Calif. acad. sci.* 29: 17-21.
- Downey, J. C., 1961. Tribe Plebejini. The blues. In Ehrlich, P. R., & Ann H. Ehrlich, *How to know the butterflies* pp. 228-242. Wm. C. Brown Co., Dubuque, Iowa.
- Jepson, W. L., 1925. *A manual of the flowering plants of California*. 1238 pp., 1023 figs. University of California, Berkeley.
- Mattoni, R. H. T., 1954. Notes on the genus *Philotes* (Lycaenidae: Lepidoptera). I. Descriptions of three new subspecies and a synoptic list. *Bull. so. Calif. acad. sci.* 53: 157-165.
- McDunnough, J. H., 1938. Check list of the Lepidoptera of Canada and the United States of America. *Mem. so. Calif. acad. sci.* 1: 1-275.
- Munz, P. A., 1959. *A California flora*. 1681 pp., 134 figs. Univ. Calif. Press, Berkeley.
- Paterson, D., & J. A. Powell, 1960. Lepidoptera collecting in the Sierra San Pedro Martir, Baja California. *Journ. lepid. soc.* 13: 229-235.
- Powell, J. A., 1958. Additions to the knowledge of the butterfly fauna of Baja California Norte. *Lepid. news* 12: 26-32.
- Rindge, F. H., 1948. Contributions toward a knowledge of the insect fauna of Lower California. No. 8. Lepidoptera: Rhopalocera. *Proc. Calif. acad. sci.* 34: 289-312.
- Thorne, F., 1962. Season's summary, 1961, Zone 1: California, Arizona, Nevada. *News lepid. soc.* 4(3): 1-3.