A REVIEW OF GLAUCOPSYCHE, THE SILVERY BLUES, IN CALIFORNIA (LYCAENIDAE)

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The genus *Glaucopsyche* Scudder, 1872, is represented in California by two species: *lygdamus* (Doubleday) and *xerces* (Boisduval). The former is widespread throughout the length of California and consists of three named subspecies of which there are intermediates and blend zones, plus variant local populations. The latter has been recorded only from the San Francisco Peninsula and is now presumably extinct.

The primary purpose of this paper is to bring together most of the older published reports on *Glaucopsyche*, giving insofar as possible, the known information on distribution, food plants, type localities, and how the subspecies differ from each other.

A secondary purpose is to confirm the occurrence of *Glaucopsyche lygdamus columbia* in California. More than 40 years ago it was stated by Comstock (1927) that "Another race of *behrii* has been separated by Dr. Skinner, under the name *columbia*, which occurs in the mountains of northern California, Oregon and Washington." More recently it has been indicated (Storer and Usinger, 1963) that the subspecies in the Sierra Nevada is *Glaucopsyche lygdamus behrii*. Museum and private collections may have interior (Sierra Nevada, Cascades) specimens determined either way.

Glaucopsyche lygdamus shows clinal tendencies with each subspecies blending into one or more subspecies at various points in their respective ranges. This appears to be the case in California with typical *behrii* in the Coast Range, and the Sierra Nevada/Cascades populations being the atypical southern extension of *columbia* from Washington and Oregon.

The species and subspecies of *Glaucopsyche* are given below in the categories and sequence as listed by dos Passos (1964).

Genus Glaucopsyche Scudder, 1872

Scudder, S. H., 1872. A systematic revision of some of the American Butterflies; with brief notes on those known to occur in Essex County, Mass., p. 33, (Salem, Mass.).

Generotype: Polyommatus lygdamus Doubleday, 1842.

In the Nearctic area this genus is represented by only two species. One of these, however, is composed of a rather extensive array of named subspecies (and synonyms), with much blending and intermediate forms.

The adult *Glaucopsyche* are recognized by a transverse median—postmedian row of rounded black spots sharply ringed with white on the underside. Distal to these spots there are no other markings, which is distinctive, because additional maculation is prevalent in other Plebejinae. The upperside of the males characteristically is a bright, silverish blue. Depending upon subspecies, the females are either brown, or have varying amounts of blue overscaling on the upperside of the wings.

Glaucopsyche lygdamus (Doubleday)

Polyommatus lygdamus Doubleday, 1842, Entomologist, no. 14, p. 209, London.

The silvery blue is the common name applied to the nominotypic subspecies *l. lygdamus*. This subspecies occurs in the eastern United States.

Type data: Pine forests of Georgia, in the British Museum (Natural History)— Comstock & Huntington (1961); Screven Co., Georgia—Klots (1951).

However, the species as a whole has an extensive range. It occurs in the northern United States from coast to coast; across all of Canada northward into the boreal regions of Alaska, the Yukon and the Northwest Territories; south in the Appalachians to Georgia, Alabama and Arkansas; south in the western Great Plains and the Rocky Mountains to New Mexico and Arizona; Great Basin and the Pacific Coast south into Baja California, Mexico.

The altitudinal range is from sea level to above timberline.

Early stages: Oviposition occurs after the adult mating in the spring. The larvae feed in spring and/or summer, with diapause occurring in the pupal stage. The mature larvae are, depending on subspecies and individuals, variably colored, from pale green or pale coffee color to purplish, with a darker dorsal stripe, often reddish brown with a purplish tinge. In the middle of the tenth segment there is a gland providing a secretion for which ants tend the larvae, a long known phenomena widespread in the Lycaenidae, and confirmed in *Glaucopsyche* (Downey & Lange, 1956). The body is "frosted" with numerous white hairs. The brownish pupae are formed amid debris and are suspended to a fixed object by means of the cremaster and a silken girdle.

Foodplants: Many Leguminosae, including Astragalus (rattle-weeds, loco-weeds); Lathyrus (everlasting peas), L. couperi (beach pea), L. ochroleucus, L. caroliniana; Lotus (trefoils), L. glaber, L. scoparius (deerweed); Lupinus (lupines), L. micranthus; Vicia (vetches), V. cracca, V. gigantea (giant vetch). Other hosts according to Downey (in Ehrlich, 1961) include the legume Hedysarum boreale (northern loments) and Adenostoma fasciculatum (chamise, greasewood) (Rosaceae).

Adults: The adults appear early in the season, fly briefly, and are single brooded, March (at sea level and south), to early June (at timberline and far north).

Glaucopsyche l. australis Grinnell

Glaucopsyche behrii australis Grinnell, 1917, Canad. Ent., 49 (10): 350.

The southern blue is the subspecies represented in cismontane southern

California and Baja California, Mexico; ranging northward in the Coast Ranges of central California, it integrades into *behrii*.

Typical southern examples may be distinguished from their northern relatives by the greater amount of blue on the upperside of the female, and by the smaller black spots on the underside of the hindwings. Specimens in which these spots have become obsolete may be referred to the aberrant form "sinepunctata" J. A. Comstock, 1926.

The blend zone appears to be an irregular line from Monterey and San Luis Obispo Counties eastward into Kern County. Populations on the coast south of Big Sur, Monterey County, have mostly dark females as in *behrii*, but smaller underside hindwing spots as in *australis*. Examples from Nacimiento Lake, San Luis Obispo County, show similar intermediate tendencies, whereas some specimens from Walker Pass, Kern County, have extensive blue on the females as in *australis*, but larger underside spots on both pairs of wings.

Type data: of *australis*, Pasadena, Los Angeles Co., Calif., May 20, 1907, in the F. Grinnell Collection; of *sinepunctata*, Mint Canyon, Los Angeles Co., Calif., May 1, 1921, in the Los Angeles County Museum.

Glaucopsyche l. behrii (Edwards)

Lycaena behrii Edwards, 1862, Proc. Acad. Nat. Sci., Phila., 2: 224.

Behr's silvery blue is the subspecies represented in the Coast Ranges of central and northern California. Common in the greater San Francisco Bay region, specimens from Monterey-San Benito to Napa-Sonoma Counties are close to "typical." Since it was described before the holotype concept, it has been speculated that W. H. Edwards' "California" locality refers to specimens from Marin County, north of San Francisco Bay. This was mentioned by Comstock (1927), with a female figured (pl. 56, fig. 24); the male underside (pl. 56, fig. 25) is of *columbia* from Plumas County (southern Cascades).

Averaging larger in size than *australis*, the underside has a row of large black spots (larger than other California subspecies) on a darkish gray ground color. The upperside of the male is a lustrous blue, with narrow dark margins. The female is dark brown, with rarely a few blue scales in the basal portions of the wings.

To the south, *behrii* blends into *australis*, as noted above. The intermediate forms do not necessarily blend uniformly in the same characters. Some specimens blend into *australis* by having smaller spots on the underside hindwings, whereas others show an increased amount of blue on the females. There may be various combinations of several characters in these intermediate populations. To the east and north, *behrii* probably blends into columbia. Truly intermediate examples from large populations are not known to me. This is due to little personal collecting in the probable areas (mentioned below), and lack of available museum specimens.

Early stages: As recorded by Williams (1908), the mature larva is "pale coffee color, lighter below the spiracles. A reddish-brown line occurs in the median line, which has a purplish tinge. Oblique dashes whitish. Sub-horizontal and horizontal bands obscure. Lateral line white, becoming purplish ventrally. Body covered with roughened long pale hairs. Shield, grayish-green." The pupa is brown, with paler metathorax and wing covers.

Foodplants: Eggs and larvae were taken in Marin County on the small annual *Lupinus micranthus* (Williams, 1908). He also recorded it from *Lotus glaber* (= *scoparius*), *Astragalus*, and a large yellow lupine (probably *Lupinus arboreus*).

Type data: of *behrii*, "California"; of the ab. *sternitzkyi* Gunder, 1929, Fairfax, Marin Co., Calif., in the American Museum of Natural History.

Glaucopsyche l. columbia (Skinner)

Lycaena lygdamus columbia Skinner, 1917, Ent. News, 28: 213.

The Columbia silvery blue is the subspecies represented in Washington and Oregon. It ranges south in the Cascades and Sierra Nevada of California. It also occurs eastward in the Great Basin, where it blends into *oro* Scudder, 1876. Intermediates may be found in Idaho, Utah, western Montana and Wyoming, although Leighton (1946), records *oro* also from Washington.

Typical *columbia* is even larger than *behrii*, and on the underside is lighter gray with the spots averaging proportionally smaller. The upperside of the female has a greater amount of blue overscaling than *behrii*, but is still predominately brown as opposed to the extensive blue on *australis* females.

The Cascade and Sierra Nevada populations in California represent an atypical southern extension of *columbia*. Examples from California show convergence toward *behrii*, with a tendency for the underside spots to become larger, and a reduction of the blue overscaling on the females.

Geographically, *columbia* is separated from *behrii* by the Sacramento and San Joaquin Valleys. Future collecting should reveal blending where the Coast Range converges with the Cascades (Mendocino, Trinity, or Shasta National Forests).

Specimens approaching *oro* have also been taken in eastern California (Inyo, Mono counties). However, until more specimens are available, and a more continuous distribution is known through Nevada and Oregon,

these will be considered as smaller, more prominently spotted examples of *columbia*.

Type: Port Columbia,¹ [Okanogan Co.], Washington, April 25, 1916, in the Academy of Natural Sciences, Philadelphia.

Glaucopsyche xerces (Boisduval)

Lycaena xerces Boisduval 1852, Ann. Soc. Ent. France, Series 2, 10: 296.

The xerces blue and its named forms were narrowly distributed on the San Francisco Peninsula from near Twin Peaks to North Beach, and the Presidio southward to Lake Merced. Lone Mountain, formerly an isolated, sandy hillock, was the classical resort of *xerces*. There are no known captures of any of these blues since World War II (Tilden, 1956). Tilden also states that it is "conceivable that the species may reappear, but such a possibility seems remote. Downey & Lange (1956) are more precise, stating that the last known specimens were collected at the Presidio during May, 1941.

Expansion of the city of San Francisco has destroyed much of the natural habitat formerly available to this blue. However, it appears that sufficient ecological niches remain that elimination of the habitat could not be the single cause of extinction. As in the case of *Cercyonis sthenele* (Boisduval), 1852 (Satyridae), which disappeared much earlier, *xerces* and its forms did not adapt to conditions further south or inland. Cold summer fogs drift over the peninsula, resulting in the climate being warmer in the winter and much cooler in the summer than on land masses in nearly every direction. Downey & Lange (1956) conclude that the "effect of a sudden shift in amplitude of these rather narrow annual climatic oscillations might have been greater on *xerces* than on comparable numbers of another species in another area where the 'normal' yearly fluctuations are more extreme."

In comparison with *lygdamus*, the males of *xerces* are more of a lilac blue rather than silverish. The females tend to be more of a grayishbrown, although this may be an artifact of old faded specimens. The typical form of *xerces* is the variety in which the black spots of the underside have disappeared, leaving large white spots on a field of steel-gray. The other forms have an increased amount of black spotting, as illustrated by Downey & Lange (1956) and most in color by Comstock (1927). Information from the literature, plus additional evidence presented by Downey & Lange (1956), show that there is a polymorphic group under the taxon *Glaucopsyche xerces*.

¹ J. C. Hopfinger sent the type specimens to Henry Skinner in 1916, and, as Brewster, Okanogan Co., then had a small local post office called Port Columbia, Skinner named the butterfly *columbia*.

Early stages: Recorded in detail by Williams (1908) and repeated with colored illustrations by Comstock (1927). The general color pattern of the larvae and pupae are very similar to that of *G. lygdamus behrii*. The larval color seems to be variable in both species. The hatching of eggs to pupation has been recorded from 31 to 48 days. The pupal stage averages between 10 and 11 months.

Foodplants: The preferred host was reported to have been Lotus glaber (=scoparius), which is still found in restricted parts of San Francisco and environs. Oviposition has been observed, and eggs and larvae have also been found on Lupinus arboreus. Williams (1908), noted that in captivity the caterpillars readily devoured the leaves and seed pods of Lupinus micranthus and Astragalus menziesii.

Adults: Museum specimens and published records indicate one brood of adults in the spring. Most specimens are March and April, but it has been recorded from late February to early June.

Type data: (as given by Comstock & Huntington (1958–1964)), of *xerces* (Boisduval), 1852, California, in the U. S. National Museum (?); of form *antiacis* (Boisduval), 1852, San Francisco, Calif., in the U. S. National Museum (?); of *intermedia* Chermock, 1929, Lone Mountain, San Francisco, Calif., in the F. H. Chermock Collection (?); of form *mertila* (Edwards), 1866, California; of form *polyphemus* (Boisduval), 1869, California, in the U. S. National Museum (?); of Ab. *huguenini* Gunder, 1925, San Francisco, Calif., April 24, 1917; of Ab. *barnesi* Gunder, 1927, San Francisco, Calif., April, 1923, in the Barnes Collection, U. S. National Museum.

LITERATURE CITED

- Сомятоск, J. A., 1927. Butterflies of California. 334 pp. + 63 colored plates. Published by the author, Los Angeles, Calif.
- COMSTOCK, W. P. & E. I. HUNTINGTON, 1958–1964. An annotated list of the Lycaenidae (Lepidoptera, Rhopalocera) of the Western Hemisphere. Part I: Genera. Jour. N. Y. Ent. Soc., 66 (1958): 103–118. Part II: Species. Jour. N. Y. Ent. Soc., 67–72 (1959–1964).
- pos Passos, C. F., 1964. A synonymic list of the Nearctic Rhopalocera. Lep. Soc. Mem., No. 1, v + 145 pp. New Haven, Conn.
- Downey, J. C. & W. H. LANGE, JR., 1956. Analysis of variation in a recently extinct polymorphic lycaenid butterfly, *Glaucopsyche xerces* (Bdv.), with notes on its biology and taxonomy. Bull. So. Calif. Acad. Sci., 55(3): 153-170.
- EHRLICH, P. R. & A. H. EHRLICH, 1961. How to know the butterflies. Pictured Key Nature Series, vii + 262 pp. W. C. Brown Co., Dubuque, Iowa.
- KLOTS, A. B., 1951. A field guide to the butterflies of North America, east of the Great Plains. xvi + 349 pp., 40 plates. Houghton-Mifflin Co., Boston, Mass.
- LEIGHTON, B. V., 1946. The butterflies of Washington. Univ. Wash. Publ. Biol., 9(2): 47-63.
- STORER, T. I. & R. L. USINCER, 1963. Sierra Nevada natural history—an illustrated handbook. v + 374 pp., 65 pl., 24 colored pl. Univ. Calif. Press, Berkeley and Los Angeles, Calif.
- TILDEN, J. W., 1956. San Francisco's vanishing butterflies. Lep. News, 10(3-4): 113-115.
- WILLIAMS, F. X., 1908. The life-history of Lycaena antiacis Bdv., with other notes on other species. Ent. News, 19(10): 476–483.