

A REVISION OF THARSALEA SCUD. (S. STR.), WITH DESCRIPTION OF A NEW SUBSPECIES (Lepid., Lyc.)

By J. W. TILDEN

In 1936 two workers, A. Klots and T. N. Freeman, both published papers on the generic and grouping assignments of the Lycaeninae. Klots' paper came out in October, Freeman's in December. The Klots paper includes a survey from a world-wide view-point; Freeman deals with the north american species only.

When Scudder (1876) proposed the genus *Tharsalea* he stressed the tailed condition of the hind wings and the general thecloid appearance. As shown by both Klots and Freeman, these characters are not trustworthy. *Hermes* Edwards has genitalia unlike *arota* Boisduval and should not be associated with it. Klots includes *hermes* in his concept of the subgenus *Tharsalea*, though not in his *arota*-group. Freeman suggests that *hermes* be removed to *Lycaena*, where McDunnough places it in his Check-list (1938). The genitalia of *hermes* and *arota* are very dissimilar, as indeed these species are in most of their general appearance. The tailed secondary is the principal character that led Scudder to associate them.

Klots treats *Tharsalea* as a subgenus of *Lycaena*. Although this usage has not become general, it is justified and is adopted here. I feel, however, that more than two subgenera are needed to express the relationships in the genus *Lycaena*. I prefer to regard *Tharsalea* in the sense of Scudder, but minus *hermes*. This restricts *Tharsalea* to *arota* Bdv. and its subspecies, as hereinafter considered. *Tharsalea* differs from closely related members of the Lycaeninae mostly in the form of the male genitalia, which are characterized by the sharply incurved and slender falces and by the simple slender valves (gonocoxites). Additional characters of value are the shape of the wings, which are more trigonate and thecloid in outline than in other american Lycaeninae, and in the choice of food plants. *Arota* and its subspecies are apparently restricted to *Ribes* and *Grossularia* (currant and gooseberry).

Klots appears to be the first to suggest that *virginiensis* Edw. is a subspecies of *arota* Bdv. With this I agree completely and have treated it as such in this paper.

The conclusions in this paper are based on the study of more than four hundred specimens from a large number of localities that include all of the known range of the species. These specimens came from the following states: Arizona, Colorado, Idaho, Nevada, New Mexico, Oregon, Utah and California. About one half of the total number examined were from California. I believe that this is due to more thorough collecting rather than to a more general abundance of the species in California.

THARSALEA Scudder 1876

Bull. Buff. Soc., III:125:1876

Type, *Polyommatus arota* Boisduval

Ann. Ent. Soc. Fr., (2) X 293:1852

Arota was described from material collected by Lorquin. The type locality is not stated in modern terms. Boisduval says: "Montagnes de la Juba, en mai et juin." As nearly as can be ascertained, the name Juba was used for a portion of the mining country of the Sierra Nevada, north and east of Sacramento, and the area involved was somewhat larger than merely the immediate environs of the Juba River. An obituary of Lorquin, read by Boisduval before the Entomological Society of France, indicates that Lorquin was in this mining region in 1852 and perhaps before. This information is obtained from a translation of Boisduval's paper, as it appears in a booklet copyrighted 1938 by Lorquin's granddaughter, Estelle H. Lorquin. It seems reasonable to consider that the Sierra Nevada at lower elevations, in the old mining region, is the type locality of *Polyommatus arota* Bdv., and it is suggested that this region be regarded as the type locality of this species at least until such time as more exact information can be obtained.

It is interesting to note that the type locality of *virginiensis* Edwards (Virginia City, Nevada), is in approximately the same latitude but east of the Sierra Nevada. *Tharsalea* occurs entirely across the sierran crest where the divide is relatively low. At Echo Summit, Eldorado County, for instance, there is no barrier between the *Tharsalea* populations on the east and west slopes of the Sierra. One can collect at Strawberry, on the west slope, across the summit and down to Meyers on the east slope and on into Alpine County and the declivity into Nevada, finding *Tharsalea* here and there all along the way. Thus the isolation

of *arota* from *virginiensis* is much more apparent than real, and this is borne out by examination of long series of specimens from areas of intergradation. These specimens show every transition from *arota* to *virginiensis*.

The range of *Tharsalea arota* (Bdv.), including its subspecies, is from southern Oregon to southern California, and from the coastal strip of California eastward to southern Idaho, Utah, Colorado, Arizona and New Mexico. In this extensive range it shows very considerable variation. Three subspecies have previously been described. A fourth is described in this paper. Still other variants might be recognized, but for the present, four names are enough to express the present author's opinions of the variational tendencies.

The most constant and dependable characteristic of color seems to be the shade of the under surfaces of the wings. This is brown with grayish tones in nominate *arota*. It is a dull buffy brown in fresh specimens of *nubila*, quite pale in *virginiensis* and dark in the previously unrecognized subspecies from the Rocky Mountain region. Such statements as that of Edwards, that "the black spots on the undersides are much heavier than in *arota*," which he makes in the description of *virginiensis*, do not hold true for all specimens. I regard the size of these spots as a character of limited value. It is true that there is an average difference in the size of the spots, but there is great variation.

a. *arota arota* (Boisduval) 1852

Type locality: "Montagnes de la Juba"

Boisduval, Ann. Ent. Soc. Fr., (2)X:293 (*Polyommatus*)

Wright, Butt. West Coast, Pl. XXVIII, figs. 238, b, c, 1907

Dyar, List N. A. Lepid., p. 40, No. 386

Seitz, Macrolep. World, Vol. V, p. 812, Pl. 145, figs. a-1,
a-2, a-3, 1924

Comstock, J. A., Butt. Calif., p. 170, Pl. 51, figs. 1, 4, 1927

Holland, Butt. Book, rev. ed., pp. 246-247 Pl. XXIX, figs.
1, 2, 1930

Klots, Bull. Brook. Ent. Soc., XXXI:154-171, Pl. VIII, fig.
13, 1936

Freeman, T. N., Can Ent., LXVIII:277-279, Pl. 17, fig. 1,
1936

McDunnough, Checklist Lepid. Can. & U.S.A., Part I, p.
26, No. 420

The color of the lower surfaces of the wings in this subspecies tends to be brown, often a dark grayish brown. Fresh specimens may show light overscaling; flown specimens tend to appear

duller due to the rubbing off of the overscaling. The spots are often smaller and more numerous than in *virginiensis*, but this character is variable. The specimens of this subspecies are moderate to small compared to specimens representing the other subspecies. The length of the forewing averages about 14 mm.

Specimens from northern California and southern Oregon tend to be somewhat smaller and a bit more contrastingly marked, but there seems to be no reason, at least at present, to consider them as other than the extreme northern extension of nominate *arota*. Specimens from the coast ranges of California, especially from south of San Francisco Bay, are browner and more suffused below than those from the Sierra Nevada. It is this material that has been widely distributed to collections and upon which many collectors base their concept of *arota*. Here again, the differences, while recognizable, seem well within the limits of one subspecies.

The range of nominate *arota*, as here considered, is from southern Oregon (apparently the northern limit of the range of the species) south to the Tehachapi Mountains in Kern County, California, and from the coast of California east into the Sierra Nevada. It intergrades with *virginiensis* along the eastern edge of its range and apparently also with *nubila* J. A. Comstock in the Tehachapi Mountain area.

One hundred seventy-one specimens were examined that seemed referable to *arota arota*; some of these however represent intergrades with other subspecies, and their position might well be considered a matter of opinion.

b. arota virginiensis (Edwards 1870) Klots 1936

Type locality: Virginia City, Nevada

Edwards, Trans. Am. Ent. Soc., III:21:1870 (*Chrysophanus*)

Wright, Butt. West Coast, Pl. XXVIII, figs. 239, b, c, 1907

Dyar, List N.A. Lepid., p. 40, No. 387, 1908

Seitz, Macrolep. World, Vol. V, p. 812, Pl. 145, fig. a-4, 1924

Comstock, J. A., Butt. Calif., pp. 171-172, Pl. 51, figs. 6, 7, 8,
1927

Holland, Butt. Book, rev. ed., p. 247, Pl. XXVIII, figs. 23,
24, 1930

Klots, Bull. Brook. Ent. Soc., Vol. XXXI, p. 164, Pl. VIII,
fig. 14, 1936

McDunnough, Checklist Lepid. Can. & U. S. A., Part I,
p. 26, No. 421, 1938

If Edwards description of *virginiensis* is compared line by line with Boisduval's description of *arota*, it will be seen that they are remarkably similar in content, and that the differences are not great. Edwards sums up by saying, "The black spots on the under

side are much heavier than in *arota*, and the orange band a marked feature." In the most extreme examples of *virginiensis*, the spots of the underside are actually more conspicuous and larger, but other specimens from the type locality show this tendency to a much smaller degree. The orange band, at the anal angle of the hind wing, varies also, and while usually better developed in *virginiensis*, is not dependable alone in recognizing this subspecies. The only diagnostic point that seems dependable is that of color. Typical *virginiensis* is lighter below than *arota*. In worn specimens, however, this character is much less evident, since the wearing off of the overscaling causes the surface to appear darker.

Nominate *arota* and *virginiensis* tend to intergrade where their ranges meet along the east slope of the Sierra Nevada, and specimens occur plentifully that cannot with certainty be placed. This has led to differences in opinion as to the proper disposition of material from the Sierra. Some collectors call all this Sierran material *virginiensis*, others call it *arota*, and I have seen specimens that might equally well be referred to either. This seems to indicate that *virginiensis* is a rather weakly differentiated subspecies, and whether or not the name is to be retained at all is a matter of opinion.

The Holland figures are not distinguishable from *arota*, being of the upper surfaces. The Comstock figures are of topotypes, and are good. Wright's figures appear to be of worn specimens, and it is not clear whether they are actually *virginiensis*. (The Wright figures of *arota* may represent *nubila* Comstock.)

At hand are several topotypes of *virginiensis* which are not noticeably different from certain specimens taken in Mono County, Calif.

The genitalic figure in the Klots paper would indicate a rather marked difference between the genitalia of nominate *arota* and *virginiensis*. I have seen no specimens with genitalia like that figured by Klots, and have found no indication that there is any difference at all between the genitalia of these two forms. Klots' figure is, as he states, made from an extreme example. I fear that the result in this case is to suggest a difference that does not in fact exist. It is of course very possible that the position of the parts in the drawing adds to this appearance of difference.

Before me are thirty-five specimens of what I regard as true *virginiensis*, topotypes and material from closely adjacent localities. Without at least one topotype for comparison, determination of this subspecies would be very uncertain.

It is not clear who first stated that *arota* and *virginiensis* can be separated by the lunulation of the submarginal band. Holland makes this statement in the Butterfly Book (page 257) and others have spoken similarly. Nominate *arota* and topotypical *virginiensis*

differ little in this respect, although *arota* may often have the submarginal band wider than does *virginiensis*. Few specimens have the band truly continuous; a tendency for the band to break up into crescents is present in most specimens. Rocky Mountain material, described below, tends to have the submarginal band broken into widely separated lunules on a dark background, but Rocky Mountain material cannot be referred to *virginiensis* because it differs so greatly from topotypical material of Edward's subspecies.

Comstock, Butt. Calif., p. 171, 51, figs. 2, 3, 5, 1927

c. *arota nubila* J. A. Comstock 1926

Type locality: Los Angeles, California

Comstock, Bull. So. Cal. Acad. Sci., XXV, p. 34, 1926

Comstock, Butt. Calif., p. 171, l. 51, figs. 2, 3, 5, 1927

Holland, Butterfly Book, rev. ed., p. 247, 1930

McDunnough, Checklist Lepid. Can & U. S. A., Part I,
p. 26, No. 420a, 1938

This representative of the species in southern California is consistently darker above and duller below than *arota arota*. The dark margins are wide above and the orange bar at the anal angle of the hind wing is reduced or obscured. The female is duller above than the female of *arota*, and the extent of the pale areas is restricted. Both sexes tend to be duller and more suffused below than are any other of the subspecies. *Nubila* seems to be restricted to California south of the Tehachapi Mountains. Some of the tendencies to dull coloration extend north along the coast and into the Tehachapi area, where occasional specimens are intermediate. Series from the type locality show relatively little variation. The above statements are based on an examination of forty-five specimens from southern California, including a pair of Dr. Comstock's paratypes. A long series from the Tejon-Tehachapi area show some tendency to grade towards *nubila*, but are referable to *arota*. From this I tend to place the northern limit of the range of *nubila* not further north than Fort Tejon.

Coastal specimens from Santa Barbara County and northward, that approach *nubila* in the dullness of the inferior surfaces, do not as a rule show the tendency to dull and restricted coloration above, and are at least for the present referred to nominate *arota*. Material from Arizona, Utah, New Mexico and Colorado is very different from any of the three subspecies treated above, and for this previously unrecognized subspecies I propose the name

Lycaena (Tharsalea) arota schellbachi, subsp. nov.

Type locality, North Rim, Grand Canyon National Park,
Arizona

Garth, John S., Butt. Gr. Can. Nat. Park, p. 33, fig. 20, 1950
(as *virginiensis*)

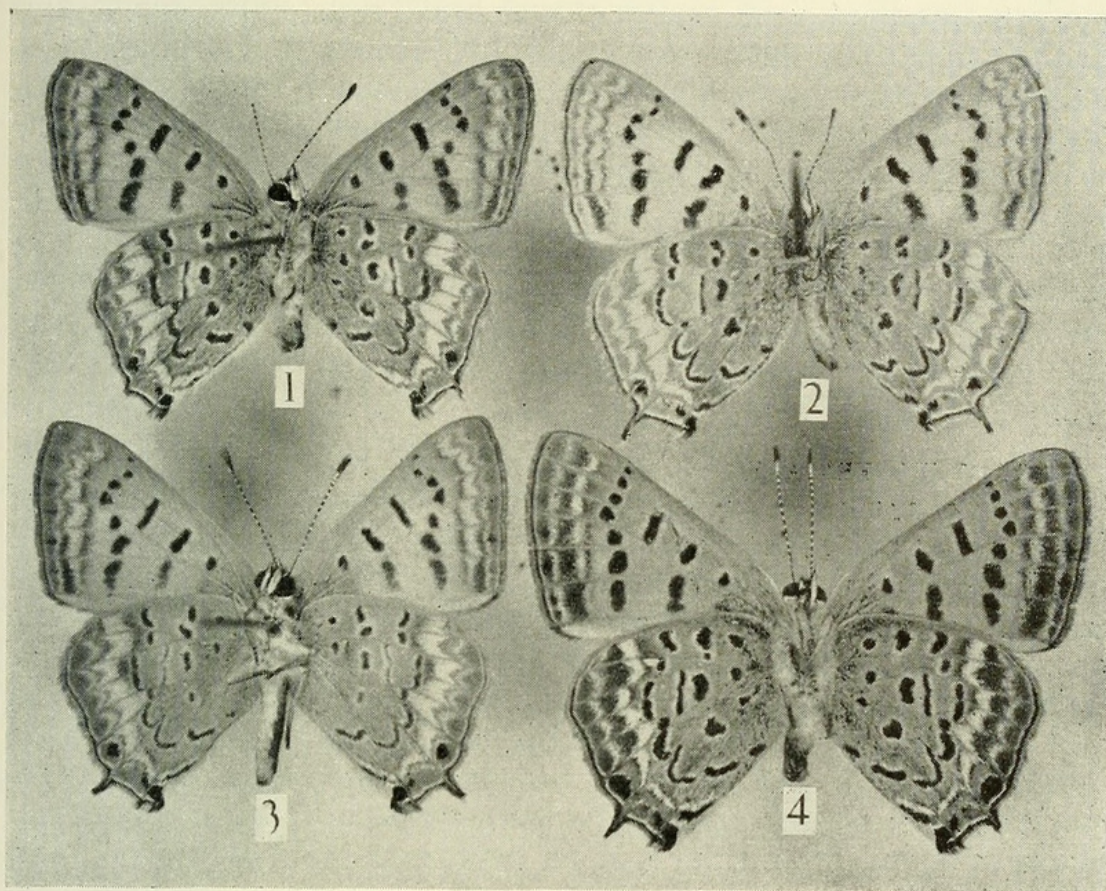


PLATE 24

1. *Lycaena (Tharsalea) arota arota* (Bdv.), Deerpark, Placer County, California, E. J. Newcomer, Coll. August 6, 1909.
2. *Lycaena (Tharsalea) arota virginiensis* (Edw.), Virginia City, Nevada, July 27, 1923, J. A. Comstock, Coll.
3. *Lycaena (Tharsalea) arota nubila* J. A. Comstock, Paratype #3, Los Angeles, (Griffith Park), Calif., July 2, 1922, J. A. Comstock, Coll.
4. *Lycaena (Tharsalea) arota schellbachii*, subsp. nov., Holotype male, Bright Angel Trail, North Rim, Grand Canyon, Arizona, June 11, 1943, L. Schellbach, Coll.

HOLOTYPE MALE:Costa of forewing 16 mm., upper surface bronzy copper with faint lilac reflections, the dark markings of the lower surface showing through faintly; terminal line narrow; dark borders about 2 mm., gradually merging with the ground color; fringes pale, becoming white at anal angle of hind wings; this angle with two dark spots outlined by a dull red band that extends into the single white-tipped tail.

Below, ground color of fore wings olive gray; terminal line white, narrow; marginal band of dark oblong spots; spots of submarginal band heavy and squarish, outlined by white; spots of median band, as well as the discal and basal spots, black and distinct, narrowly outlined in pale gray; three dull orange spots between submarginal and median bands, in interspaces M_3 , Cu_1 and Cu_2 . Hind wings, Ground color dark, but with profuse over-scaling of ashy gray; marginal band of 4 or 5 thin pale crescents; submarginal band tortuous, of pale lunules against a dark ground; spots of basal two-thirds of wing black, outlined in white; vermillion band of anal area extensive, from cell Cu_1 to anal angle, enclosing in cell Cu_2 a black spot and in the anal cells, dark gray shades; tail vermillion centrally, outlined in black and tipped with white.

ALLOTYPE FEMALE: Costa of forewing 16.5 mm.; upper surface dark brown with extensive orange-rufous areas; costa of forewing dark; discal bar of three spots, and the sub-basal and basal spots, nearly black; median band of one large spot each in cells M_3 and Cu_1 and a much smaller spot in cell Cu_2 , of the ground color of the wings; veins dark, contrasting. Hind wings, light areas more restricted, reduced to a broad submarginal band and three light rays extending from the submarginal band basad into cells M_3 , Cu_1 and Cu_2 , the veins in this area dark; tail orange, margined with black and tipped with white and with a marginal black spot on either side; fringes pale, becoming white on hind wings.

Below: as in male, except that the disc of the forewings is extensively orange, against which the dark markings stand out boldly.

Both sexes: Body dark above; legs and lower surfaces of body light; palpi light below and dark above; antennae annulated black and white.

Type material: Holotype male, Bright Angel Trail, Grand Canyon, Ariz., VI.11.43 (Schellbach); allotype female, same locality, VI.22.43 (Schellbach), bearing identification label reading "*Tharsalea virginensis* (Edw.) pos. dist. sub. sp det. W. D. Field"; twenty-three designated paratypes as follows: four males, same data as holotype; two males and two females, same data as allotype; one male, North Rim, Grand Canyon, Ariz., VII.18.34 (Lutz); three males, same locality, VIII.18.38 (E. L. Bell); one male and one female, same locality, VIII.18.46 (J. S. Garth); one male, Kaibab Trail, North Rim, Grand Canyon, Ariz., VII.9.47 (Garth); six males, same locality, VII.19.47 (Garth); one female, River View, North Rim, Grand Canyon, Ariz., VII.14.52 (Christensen); one female, Neal's Spring, North Rim, Grand Canyon, VII.9.53 (Tilden).

Type material distributed as follows: Holotype male and allotype female deposited in the United States National Museum, Washington, D. C.; Six males and one female in the collection of the Allan Hancock Foundation, University of Southern California, Los Angeles; one male and one female in the collection of the author; three males in the collection of the American Museum of Natural History; eight males and three females in the collection of the Naturalist's Work Shop, Grand Canyon, Ariz.

I take pleasure in dedicating this subspecies to Mr. Louis Schellbach, Park Naturalist, Grand Canyon National Park.

In addition to the designated type material, there has been examined the following additional material referable to this new subspecies: one male, Navajo, Arizona; ten males and three females from various localities in Utah; thirty males and thirty-five females from various localities in New Mexico; thirty-eight males and twenty-six females from various localities in Colorado. A total of one hundred sixty-eight specimens from widely separated localities in four states, was examined.

Variation in the type series: The length of the forewing of the male ranges from 14.5 to 18 mm.; that of the female from 14.5 to 17 mm. The males are remarkably alike in coloration but the females vary considerably in the extent and the intensity of the light markings. The allotype is lighter than the average in coloration, but was selected for description because it is in better condition than the other available female specimens from the type locality.

Variation in material from other localities: The material from Utah is slightly smaller (14 mm. to 16 mm. in length of forewing), and averages somewhat lighter in color. It is difficult to be sure that this is not due to the wearing of flown insects, since the fresher ones are nearly as dark as the types. These trends to smaller size and possibly lighter coloration may show a tendency on the part of the Utah populations to grade toward *virginiensis*. However, the relatively few specimens of Utah material at hand make it unwise to draw any fixed conclusions on this point at present. The sixty-four specimens from New Mexico show little difference in size or color from the type material, except a tendency to reduction of the light areas on the upper surfaces of the females. This tendency seems to me to be within the limits of one subspecies. The Colorado material is very similar to the type material, but averages near the upper limits of size.

This new subspecies has in each case been labelled as *virginiensis* in all the collections seen by me. This is somewhat surprising since *virginiensis* is the lightest of the subspecies of *arota*, while *schellbachi* is the darkest.

The range of *schellbachii* appears to be limited to the states of Arizona, New Mexico, Colorado and Utah, and seems to be the only subspecies of *arota* found in these states.

Analysis of the described subspecies of *Lycaena* (*Tharsalea*) *arota* (Boisduval):

1. *arota arota* (Boisduval)

Medium brown to grayish brown below; spots averaging small in size; type locality, probably in the Sierra Nevada at low elevations, north and east of Sacramento; range, from southern Oregon south to the Tehachapi Mountains in California, and from the pacific coast eastward into and in some places through the Sierra Nevada; intergrades with *virginiensis* to the east and to some extent with *nubila* to the south.

2. *arota virginiensis* (Edwards)

Light below; spots averaging larger in most specimens; orange-red of anal area usually more conspicuous than in *arota*; type locality, Virginia City, Nevada; range, an area of undetermined size centering around the type locality; intergrades with *arota* to the west and south; whether it also intergrades with *schellbachii* to the east is not ascertained.

3. *arota nubila* J. A. Comstock

Duller both above and below, with all light areas reduced; this tendency especially noticeable on the upper surface of the females; type locality, Los Angeles, California; Range, southern California, intergrading to some extent with *arota* in the northern portion of the range.

4. *arota schellbachii*, n. subsp.

Very dark below; spots outlined sharply by white; female with light areas of upper surface extensive; average size, largest of the four subspecies; type locality, North Rim, Grand Canyon, Arizona; range, Arizona, New Mexico, Colorado and Utah. It may intergrade with *virginiensis* in eastern Nevada and western Utah, but lack of material prevents a statement on this point.

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SUMMARY

The subgenus *Tharsalea* of the genus *Lycaena* is restricted to *Polyommatus arota* (Boisduval) 1852 and its subspecies. These subspecies are: *arota arota* (Bdv.), *arota virginensis* (Edw.), *arota nubila* J. A. Comst. and *arota schellbachii* Tilden, n. subsp., herein described.

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