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THE SUBSPECIES OF *OENEIS ALBERTA* (LEPIDOPTERA, SATYRIDAE)

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For some years *Oeneis alberta oslari* Skinner has been a very rare butterfly in collections. In early June, 1951, I had the good fortune to find it rather plentiful in South Park, Park County, Colorado. The circumstances leading to its rediscovery and some notes on its habitat have been published (1952, Ent. News, vol. 63, pp. 119–123). This recently captured series of *oslari* affords the first opportunity to compare critically the three named entities that compose the species. The first-named of these, *alberta* Elwes and Edwards, is found on the prairies of Alberta and Saskatchewan and is the best known of the three. During the following year Strecker described *daura* from the mountains of Arizona. This subspecies remained "lost" until D. K. Duncan, then of Globe, Arizona, recovered it in the vicinity of McNary in the White Mountains of Arizona during the early thirties. *Oslari* was last described. So far as I know the only true *oslari* in museum collections are the two pairs sent by Oslar to Skinner. All others that I have seen have been abberant *Oeneis uhleri uhleri* Reakirt. The data of Oslar's specimens misled collectors; they were taken in September, 1909.

With almost 100 specimens representing the species before me it is quite evident that *daura* is distinctive—a large, pale tawny creature. The other two subspecies are much alike, smaller and grayer than *daura*. In addition to size and color certain other items have been used to describe and differentiate the three butterflies: maculation, the limbal band on the upper side of the forewing, and the median band on the under side of the hind wing. These notes are based on my detailed study of the above variables.

[1] Colorado Springs, Colorado.

DESCRIPTIONS OF THE SAMPLES

Oeneis alberta daura Strecker

Chionobas daura STRECKER, 1894, Canadian Ent., vol. 26, p. 225.

A series of 19 males and nine females collected by Duncan near the junction of Williams and Paradise creeks near the town of McNary in Apache County, Arizona, in meadows at an altitude of about 9000 feet, during the first nine days of June, 1933. So far as I can tell from the original description, my series is typical of the subspecies.

Oeneis alberta alberta Elwes and Edwards

Oeneis alberta ELWES AND EDWARDS, 1893, Trans. Ent. Soc. London, p. 467, pl. 15, fig. 2.

A short series of eight males and two females collected by R. J. Fitch on the prairie near Lloydminster, Saskatchewan, Canada, in various years during the last three weeks of May. These butterflies are smaller and darker than the material than I have seen from Alberta.

A series of two males and eight females collected by C. Garrett at Carbon, Alberta, between June 5 and 18 which, with the following pair from Calgary, seem to be close to typical *alberta* as described.

A male and a female from Calgary, Alberta, Canada. The first of these was collected by F. H. Dodd on May 23, 1894, and the second by C. Garrett on June 9.

All the Alberta specimens are in the American Museum of Natural History. The Garrett material came from the Gunder Collection.

Oeneis alberta oslari Skinner

Chionobas alberta oslari SKINNER, 1911, Ent. News, vol. 22, p. 220.

A series of 25 males and 14 females collected by me on June 11 and 12, 1951, on Crooked Creek and Trout Creek near Fairplay, Park County, Colorado, in meadows at an elevation of about 9800 feet. There is no doubt that this is the same insect as that described by Skinner.

On June 4 and 5, 1952, I took 32 males and eight females at Crooked Creek. Of these a living pair was sent to Mr. Cyril F. dos Passos who has succeeded in bringing some of the larvae into the fifth instar. Mr. dos Passos reports that the larvae of *alberta*

and *oslari* are very much alike. The native food plant is a species of *Festuca*, probably *idahoensis*.

COLOR

The use of descriptive terms for the colors observed in these insects does not lend itself to analysis. Instead I have arranged each series in an ascending order of color intensity, then divided each into a series of color categories that are recognizably different. On this basis the gamut of tones observed on both sexes falls into nine categories. The next step was to determine the per cent of each series that fell into each of the categories. The result of this was compared series-wise. Unfortunately I had returned the material borrowed from the American Museum of Natural History before doing this. Thus the distribution of color intensity reported

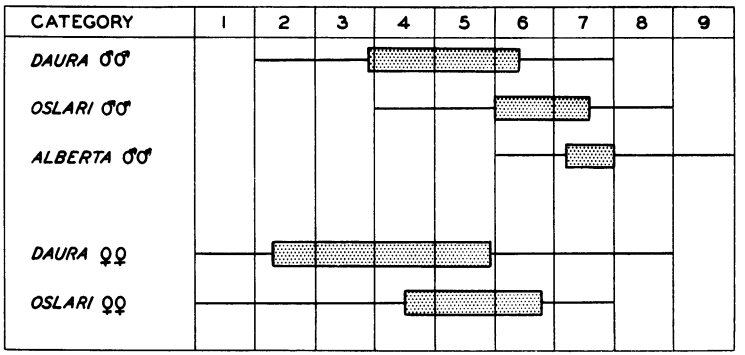

FIG. 1. The color range of the samples studied. Stippled blocks represent the range of the mid 50 per cent. Lines represent the total range on a nine-point scale. Based on table 1.

TABLE 1

VARIATION IN COLOR

Subspecies	Lightest Category	Mid 50%	Darkest Category
Males			
daura	2	3.6–6.4	7
oslari	4	6.0–7.6	8
alberta[a]	6	7.2–8.0	9
Females			
daura	1	2.3–5.9	8
oslari	1	4.5–6.8	7
alberta[a]	—	—	8

[a] Based on nine males and two females from Saskatchewan.

here for *alberta* applies only to my Saskatchewan series. My notes indicate that the Alberta material is somewhat lighter—"essentially the same as that of *oslari:* possibly faded (?)."

The results of this investigation are shown in table 1 and figure 1. It is evident that there is a strong tendency for the color to become darker from south to north in both sexes. This may be wholly a response to climatic conditions. The females tend to be a little lighter in color than the males. The two southern subspecies, *daura* and *oslari,* are quite distinct. On the other hand *oslari* does not differ appreciably from *alberta* when all of the Canadian specimens are considered.

SIZE

The measure of size that I have used is the radius of the left forewing taken with a vernier caliper to the nearest tenth of a

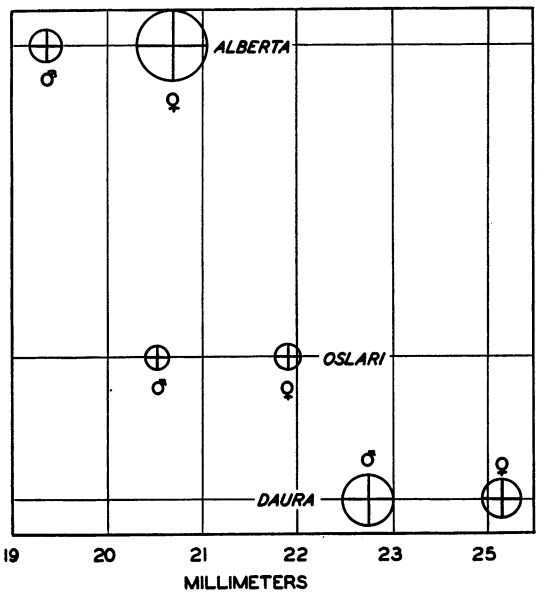

FIG. 2. The mean length of the left forewing. Circles have a radius of *P.E* On this and figures 3 to 7 the horizontal lines are spaced proportionally to the latitude differences. Based on table 2.

millimeter. Size seems to decrease in both sexes from south to north. When the differences in size are divided by their probable

errors, there appear to be statistically valid differences between *daura* and the other subspecies and between the males of *oslari* and *alberta*. I doubt that the difference in the latter case is of taxonomic importance. The parameters of size are given in table 2 and the statistics of the differences in table 3.

Variation in size of the individuals within a series seems to be conservative. This may be a characteristic of *Oeneis*, since it is also

TABLE 2

PARAMETERS OF SIZE

Subspecies	*N*	Mean Radius	*S. E.*	*V*
Males				
daura[a]	19	22.74 mm.	1.59 mm.	7.0
oslari	25	20.53	0.81	3.9
alberta	11	19.38	0.71	3.6
Females				
daura	9	24.16	0.85	3.5
oslari	14	21.92	0.67	3.1
alberta	11	20.71	1.64	7.9

[a] If one 18.2-mm. dwarf is omitted, the figures are 18, 22.99, 1.07, and 4.8, respectively.

TABLE 3

STATISTICS OF THE DIFFERENCES

Pair	Difference	$P. E._d$	$t_{P. E.}$
Males			
daura-oslari	2.21 mm.	0.27 mm.	8.2
daura-alberta	3.36	0.29	11.6
oslari-alberta	1.15	0.19	6.0
Females			
daura-oslari	3.34	0.23	15.2
daura-alberta	3.45	0.40	8.6
oslari-alberta	1.21	0.37	3.3

true of *uhleri*. I have found generally a coefficient of variation around 7 to be normal for the size of butterflies. Among the insects here reported, *V* is much less than this except for the males of *daura* and the females of *alberta*, where it is 7.0 and 7.9, respectively. It is possible that larger series will prove the lower numbers to be more normal for *Oeneis*.

MACULATION

There are partial series of spots in the limbal areas of both

wings on both surfaces of these insects. For this study I tabulated those found on the upper side. Since asymmetry occurs I used only those on the left wings. In scoring each specimen I recorded these spots as "present," "traces," or "absent." Since no two persons would agree on the tallies for the first two categories I later lumped them together when preparing table 4. The trends shown on the upper side are repeated on the under side.

Although there is a slight decrease in the development of the maculation from south to north, none of the differences found are statistically significant. This is especially true of the males. Among the females there are differences that do approach significance. Only on *daura* females does a spot occur with some regularity in M_3-Cu_1 on the hind wings. However, about 3 per cent of

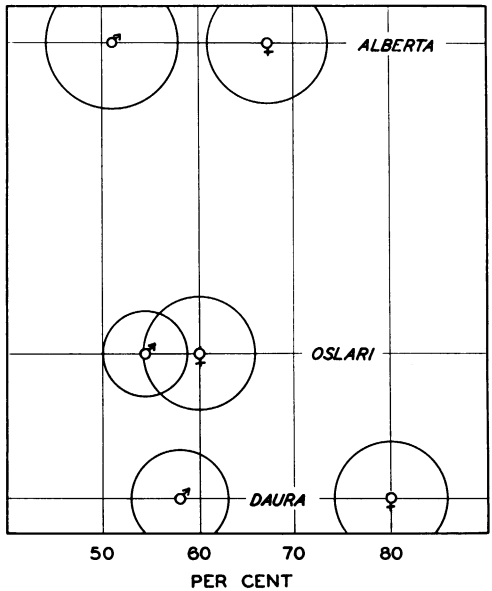

FIG. 3. Development of maculation. The points plotted indicate the per cent found of the total number of spots possible. Circles have a radius of *S.E.* Based on table 4.

samples of *daura* females containing nine specimens may be expected to be free of this spot, as are the samples studied of the other subspecies. Only in the case of the series of *oslari* females does the frequency for the spots in M_1–M_2 and Cu_1–Cu_2 fall below 100 per

TABLE 4

FREQUENCY WITH WHICH SPOTS ARE MET ON UPPER SIDE

Subspecies	Forewings			Hind Wings		Total
	M_1-M_2	M_3-Cu_1	Cu_1-Cu_2	M_3-Cu_1	Cu_1-Cu_2	
Males						
daura	100.0%	31.6 ± 10.7%	79.8 ± 9.2%	0.0%	79.8 ± 9.2%	57.9 ± 5.1%
oslari	100.0	24.0 ± 8.0	72.0 ± 9.0	4.0 ± 3.9	72.0 ± 9.0	54.4 ± 4.5
alberta	100.0	27.3 ± 13.4	63.7 ± 14.2	0.0	63.7 ± 14.2	50.9 ± 6.7
Females						
daura	100.0	77.8 ± 14.0	100.0	33.3 ± 15.7	88.9 ± 10.5	80.0 ± 6.0
alberta	92.8 ± 6.9	57.2 ± 13.2	85.6 ± 9.4	0.0	64.3 ± 12.8	60.0 ± 5.9
alberta	100.0	72.8 ± 13.4	100.0	0.0	63.7 ± 14.2	67.3 ± 6.3

cent. The data suggest that about one among eight similar sized samples will show these spots on every specimen.

In each subspecies the females are more spotted than are the males. It appears that the spot in M_3–Cu_1 on the forewings occurs significantly more often on the females than on the males. This is definitely true for *daura* and *alberta* and probably so for *oslari*. There is no significance in the difference between the sexes of *oslari* when the total maculation is considered. The difference found between the sexes of *daura* is significant at the 0.5 per cent level of confidence and at the 7.5 per cent level between the sexes of *alberta*. The numerical data on which these conclusions are

TABLE 5

FREQUENCIES WITH WHICH A VADUM IS FOUND ON THE FOREWING

Subspecies	Males	Females
daura	79.8 ± 9.2%	100.0%
oslari	64.0 ± 9.6	100.0
alberta	54.6 ± 15.0	81.9 ± 11.5

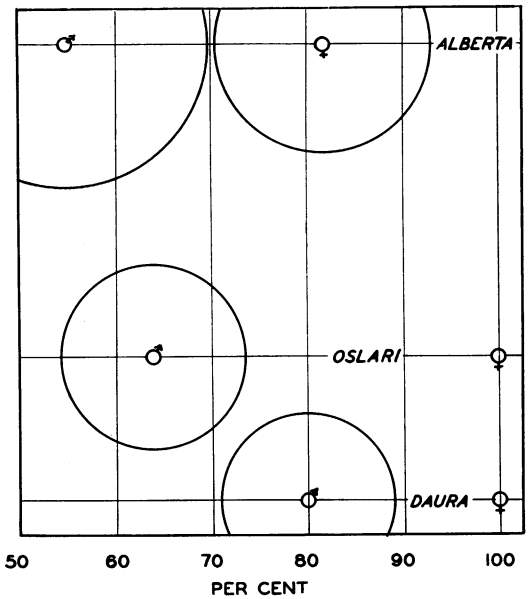

FIG. 4. Development of the marginal band on the upper side of the forewings. The points plotted indicate the frequency in per cent with which the band was found. Circles have a radius of *S.E.* Based on table 5.

based are presented as table 4. Figure 3 shows graphically the data in the last column.

THE MARGINAL BAND ON THE FOREWINGS

The band in question is a narrow dark zone, rarely 2 mm. wide, on the outer margin of the upper side of the forewings. It is rather variable in definition and sometimes absent. Although there is a definite trend in the degree to which this band is developed, decreasing from south to north, there is little significance in the differences observed. The greatest difference is significant at the

TABLE 6

FREQUENCIES WITH WHICH LIGHT LIMBAL BAND OCCURS ON UPPER SIDE OF FOREWINGS

Subspecies	Males	Females
daura	79.8 ± 9.2%	88.9 ± 10.5%
oslari	96.0 ± 1.9	85.6 ± 9.4
alberta	27.3 ± 14.2	100.0

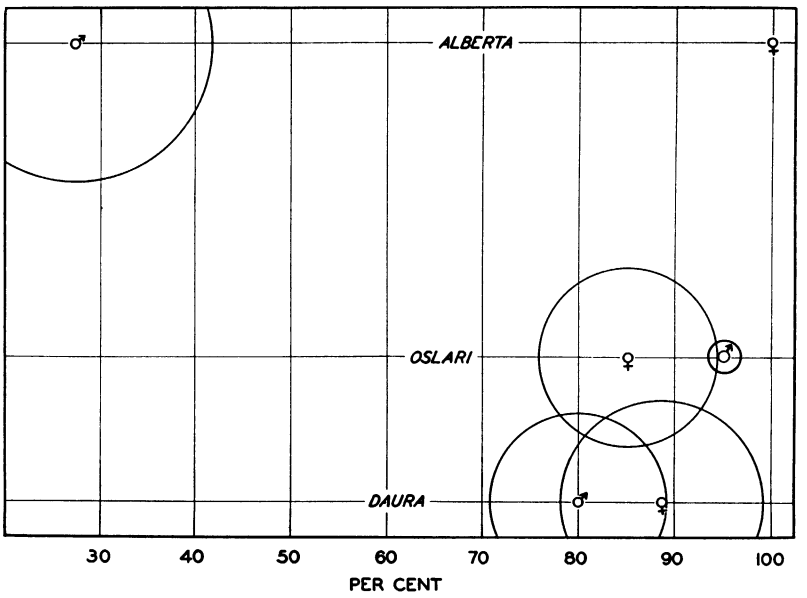

FIG. 5. Development of the limbal band on the upper side of the forewings. The points plotted indicate the frequency in per cent with which the band was found. Circles have a radius of *S. E.* Based on table 6.

15.3 per cent level which means little statistically and nothing taxonomically. The frequency data for the appearance of the band are given in table 5. Figure 4 presents the same data graphically.

THE LIMBAL BAND ON THE FOREWINGS

Skinner, in his description of *oslari*, stressed the band of lighter-colored scales across the outer part of the forewings. This band is intersected by darker lines of varying width along the veins. These break the band into subquadrate patches. The lighter spots are reddish or yellowish brown. The band seems to be a constant condition on the females. On the males it varies considerably in occurrence and definition.

There is no significance in the different frequencies with which I met the band on the series of females studied. Among the males a different situation prevails. On *oslari* males the band is most constant and rarely absent. If it be assumed that my series is really representative of the subspecies, the data suggest that a similar-sized sample of *oslari* with the *daura* frequency might be gathered at random only once in a thousand times. On the other hand the *oslari* condition might be expected to occur among *daura* samples almost 10 per cent of the time. There is no doubt that the differences between *alberta* and the other subspecies is real and significant both statistically and taxonomically.

On *daura* males the band is found most frequently only as traces, while on the females it is well defined. The reverse is true of *oslari* where the band is usually well defined on the males and found on the females as traces. On *alberta* there are rarely more than traces on either sex.

Essentially the same band occurs on the hind wings. There it seems to be present much more often, and there seems to be no real difference from subspecies to subspecies.

THE LIMBAL LINE ON THE UNDER SIDE OF THE FOREWINGS

On the under side of the forewings there is a line of dark scales that extends from near the end of the cell towards the inner margin of the wing. This line varies considerably in definition: it may be bold or weak or even absent; it may be broken into shallow lunes. For convenience I have classified the conditions found into three categories: well developed, weakly defined, and absent or almost so. The data thus accummulated constitute table 7.

While the data within this table are consistent with my own opinion of the condition observed, another observer might produce slightly different frequencies by different decisions on borderline cases.

Here again there is a definite change from north to south. In

TABLE 7

CONDITION OF LIMBAL LINE ON UNDER SIDE OF FOREWINGS

Subspecies	Condition	Males	Females
daura	Well developed	5.4 ± 5.0%	11.1 ± 10.5%
	Weakly defined	26.3 ± 10.1	78.8 ± 14.0
	Absent	67.3 ± 10.7	11.1 ± 10.5
oslari	Well developed	24.0 ± 8.0	21.4 ± 10.9
	Weakly defined	40.0 ± 9.8	57.2 ± 13.2
	Absent	36.0 ± 9.6	21.4 ± 10.9
alberta	Well developed	54.5 ± 15.0	81.9 ± 11.5
	Weakly defined	45.5 ± 15.0	18.1 ± 11.5
	Absent	9.1 ± 8.6	0.0

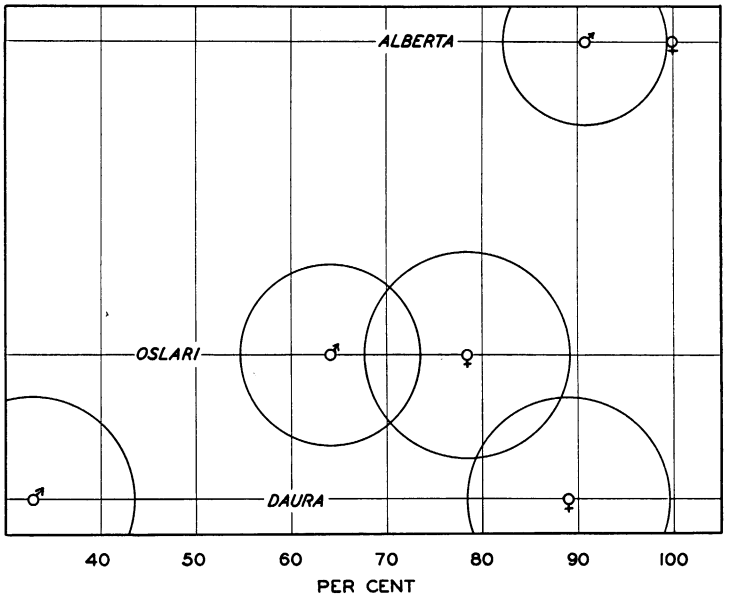

FIG. 6. Development of the limbal line on the under side of the forewings. The points plotted indicate the sums of the frequencies in per cent for "well-developed" and "weakly defined" lines. Circles have a radius of *S.E.* Based on table 7.

this case the more boldly marked specimens come from the northern parts of the range of the species. The males of *daura* are significantly less well marked than those of the other subspecies. The females of *alberta* are significantly better marked than those of the other subspecies. Table 7 and figure 6 present the data accumulated.

TABLE 8

CONDITION OF MEDIAN BAND ON UNDER SIDE OF HIND WINGS

Subspecies	Condition	Males	Females
daura	Well defined	5.4 ± 5.0%	22.2 ± 14.0%
	Weakly defined	67.3 ± 10.7	66.7 ± 15.7
	Almost absent	26.3 ± 10.1	11.1 ± 10.5
oslari	Well defined	76.0 ± 8.0	78.6 ± 10.9
	Weakly defined	16.0 ± 7.3	21.4 ± 10.9
	Almost absent	8.0 ± 5.4	0.0
alberta	Well defined	100.0	90.9 ± 8.6
	Weakly defined	0.0	9.1 ± 8.6
	Almost absent	0.0	0.0

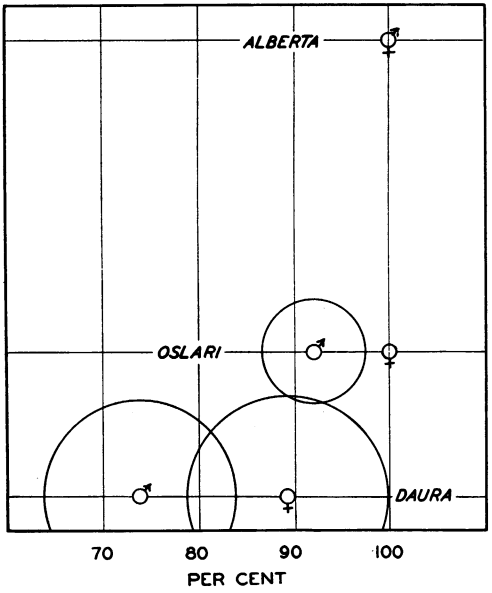

FIG. 7. Development of the median band on the under side of the hind wings. The points plotted indicate the sums of the frequencies in per cent for "well-defined" and "weakly defined" lines. Circles have a radius of *S.E.* Based on table 8.

THE MEDIAN BAND ON THE UNDER SIDE OF THE HIND WINGS

On the under side of the hind wings is a band characteristic of many species of *Oeneis*. On the species under investigation this band varies in definition. On a few specimens of *daura* and *oslari* the band is wholly absent; the under side then resembles that of typical *uhleri uhleri*. The male genitalia of such specimens readily place them with the proper species. To a large extent the variation in this band depends upon the development of a white bordering area. When this area is well developed the band is bold. For statistical purposes I have tabulated the condition of this band as well defined, weakly defined, and almost absent.

There is a trend from north to south in the definition of this band. It is better developed among northern specimens than among southern. There also is a sex difference, the band being more evident on females than males except in *alberta* where there is no real difference. The subspecies *daura* is statistically and taxonomically different in respect to the band from the other two subspecies among the males and possibly so among the females. *Alberta* and *oslari* do not differ significantly. The compiled data are presented in table 8 and figure 7.

THE MALE GENITALIA

I have been unable to find any constant and real differences among the preparations I have made representing the three subspecies. The dorsal process near the base of the valve varies somewhat and seems to be a little broader and blunter in *daura* than in either of the other subspecies. I doubt that this condition is constant enough to warrant its use taxonomically.

COMPARISON OF 1951 WITH 1952 *OSLARI*

As a whole the catch of 1952 is a little darker than that of 1951. The lightest of all my specimens is almost as light as average *O. ivallda* Mead and the darkest almost as dark as the darkest *O. chryxus chryxus* Doubleday and Hewitson in my long suite of series. To demonstrate the year-to-year variation found among *oslari* collected at the same spot and to expand the statistical base for this subspecies I have tabulated the same data as for the 1951 catch (see tables 9–16). The conclusions that can be drawn from them are as follows. Table 11 shows that although each sex in the 1952 catch is a little larger than that in the 1951 catch,

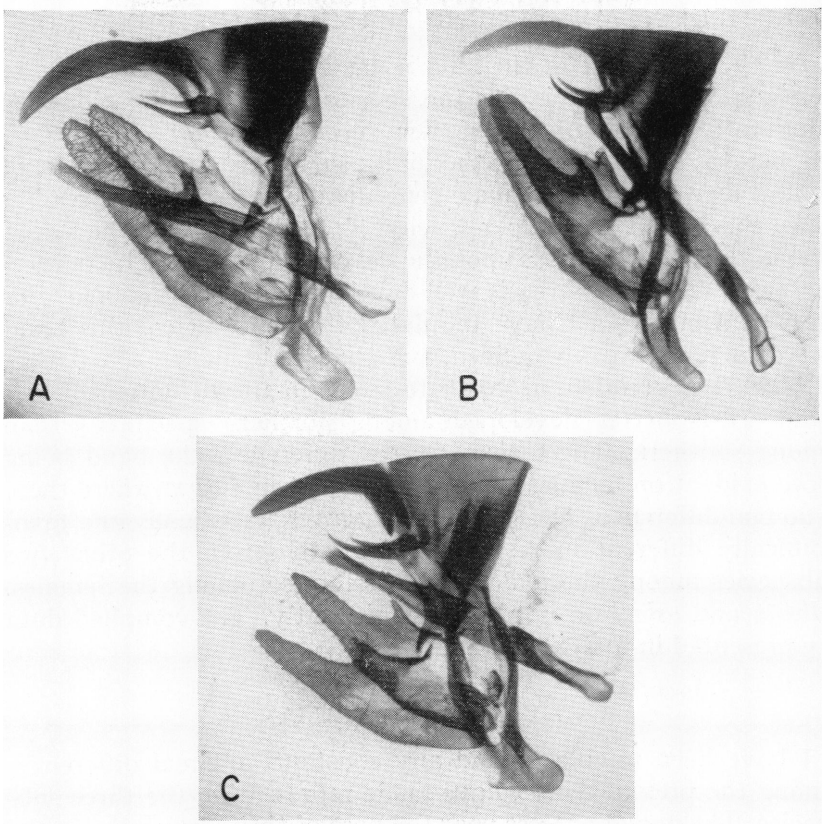

FIG. 8. Male genitalia of *Oeneis alberta*. A. *O. alberta daura*, Williams and Paradise creeks, near McNary, White Mountains, Arizona, June 6, 1935 (D. K. Duncan). B. *O. alberta oslari*, Trout Creek, near Fairplay, Park County, Colorado, June 11, 1951 (F. M. Brown). C. *O. alberta alberta*, Carbon, Alberta, June 5 (C. Garrett).

there is no significance in the differences. Table 12 proves there is no significance in the differences between the two catches in the frequency of the upper surface spotting. In table 13 the much higher frequency of the occurrence of the vadum for the 1952 catch may be related to the darker ground color of the series. Although the differences among the males is statistically significant, it has no taxonomic significance but may have some biological significance. There is no significance in the differences found in the limbal band, as expressed in table 14. However, table 15 shows that the under side of the 1952 series is definitely more

boldly marked, thus approaching the condition found in *alberta*. This too may be related to the generally darker tone of the series. Table 16 shows that there is no significance in the differences found on the under side of the hind wings.

The 1952 series in no way alters the conclusions drawn in the basic study. If anything the added data tend to strengthen the contention that *oslari* and *alberta* may constitute a single variable subspecies.

The differences observed are in general of a degree to be expected between two series drawn from a single population. Where the differences are statistically significant or almost so they may

TABLE 9

VARIATION IN COLOR IN *oslari*

	Lighest Category	Mid 50%	Darkest Category
Males			
1951	4	6.0–7.6	8
1952	3	5.7–8.4	9
Females			
1951	1	4.5–6.8	7
1952	3	5.0–5.0	8

TABLE 10

PARAMETERS OF SIZE (IN MILLIMETERS) FOR *oslari*

	N	Mean	*S. E.*	*V*
Males				
1951	25	20.35	0.81	3.9
1952	31	21.14	0.74	3.5
All	56	20.90	0.82	3.9
Females				
1951	14	21.92	0.67	3.1
1952	7	22.73	0.97	4.3
All	21	22.19	0.85	3.8

TABLE 11

STATISTICS OF DIFFERENCES FOR *oslari*

	Difference	$P.E._d$	$t_{P.E.}$
Males	0.79 mm.	0.14 mm.	5.6
Females	0.81	0.29	2.8

TABLE 12

FREQUENCY WITH WHICH SPOTS ARE MET ON UPPER SIDE IN *oslari*

	Forewings			Hind Wings		
	M_1-M_2	M_3-Cu_1	Cu_1Cu_2	M_3-Cu_1	Cu_1-Cu_2	Total
Males						
1951	100%	24.0 ± 8.0%	72.0 ± 9.0%	4.0 ± 3.9%	72.0 ± 9.0%	54.4 ± 4.5%
1952	100	32.3 ± 8.4	64.5 ± 8.7	3.2 ± 3.2	83.9 ± 6.8	56.8 ± 4.0
All	100	28.6 ± 6.1	67.9 ± 6.2	3.6 ± 2.5	78.6 ± 5.5	57.7 ± 4.0
Females						
1951	92.8 ± 6.9	57.2 ± 13.2	85.6 ± 9.4	0.0	64.3 ± 12.8	60.0 ± 5.9
1952	100	57.2 ± 18.5	100	14.3 ± 12.8	85.7 ± 12.8	71.4 ± 7.7
All	95.4 ± 4.8	57.2 ± 11.0	90.5 ± 6.2	4.8 ± 4.8	71.4 ± 10.0	63.8 ± 4.7

TABLE 13

FREQUENCY WITH WHICH A VADUM IS FOUND ON THE FOREWING IN *oslari*

	Males	Females
1951	64.0 ± 9.6%	100.0%
1952	90.3 ± 5.3	100.0
All	87.5 ± 4.5	100.0

TABLE 14

FREQUENCY WITH WHICH LIGHT LIMBAL BAND OCCURS ON UPPER SIDE OF FOREWINGS IN *oslari*

	Males	Females
1951	96.0 ± 1.9%	85.6 ± 9.4%
1952	90.3 ± 5.3	100.0
All	92.9 ± 3.4	90.4 ± 6.4

TABLE 15

CONDITION OF LIMBAL LINE ON UNDER SIDE OF FOREWINGS IN *oslari*

	1951	1952	All
Males			
Well developed	24.0 ± 8.0%	41.9 ± 8.4%	33.9 ± 6.2%
Weakly defined	40.0 ± 9.8	41.9 ± 8.4	41.1 ± 6.6
"Absent"	36.0 ± 9.6	16.2 ± 6.5	25.0 ± 5.7
Females			
Well developed	21.4 ± 10.9	71.4 ± 17.1	38.1 ± 10.5
Weakly defined	57.2 ± 13.2	28.6 ± 17.1	47.6 ± 11.0
"Absent"	21.4 ± 10.9	0.0	14.3 ± 7.6

TABLE 16

CONDITION OF MEDIAN BAND ON UNDER SIDE OF HIND WINGS IN *oslari*

	1951	1952	All
Males			
Well developed	76.0 ± 8.0%	80.7 ± 7.1%	78.6 ± 5.5%
Weakly defined	16.0 ± 7.3	16.1 ± 6.5	16.1 ± 4.8
Absent	8.0 ± 5.4	3.2 ± 3.2	5.3 ± 3.0
Females			
Well developed	78.6 ± 10.9	57.2 ± 18.6	71.4 ± 10.0
Weakly defined	21.4 ± 10.9	42.8 ± 18.6	28.6 ± 10.0
Absent	0.0	0.0	0.0

be the result of the differences in the climate of the collecting point between the two periods, June, 1950, to May, 1951, and June, 1951, to May, 1952. This difference was slight but measurable. The latter period was slightly cooler and slightly wetter. There are no temperature records available for Fairplay, but the United States Forest Service does record the precipitation at the Fairplay Ranger Station.

TABLE 17

PRECIPITATION (IN INCHES) AT FAIRPLAY RANGER STATION[a] DURING LIFE SPAN OF *Oeneis alberta oslari*

	1950–1951	1951–1952
June	0.96	1.20
July	1.93	1.16
August	0.55	2.41
September	1.08	0.56
October	0.13	1.67
November	0.70	1.04
December	0.50	2.07
January	1.40	0.60
February	0.90	0.28
March	0.80	1.72
April	1.40	1.13
May	1.59	1.12
oslari-year	11.67	14.96

[a] Courtesy of the United States Forest Service.

SUMMARY AND CONCLUSIONS

daura Strecker:

Color significantly lighter than that of any other subspecies.

Size significantly larger than that of either of the other subspecies.

Maculation not distinctive.

Limbal band significantly different from that of *alberta* and possibly from that of *oslari*.

Limbal line in males distinctly different from that in the other subspecies.

Median band significantly different from that of other subspecies.

Male genitalia possibly differ in minor detail from those of the other subspecies.

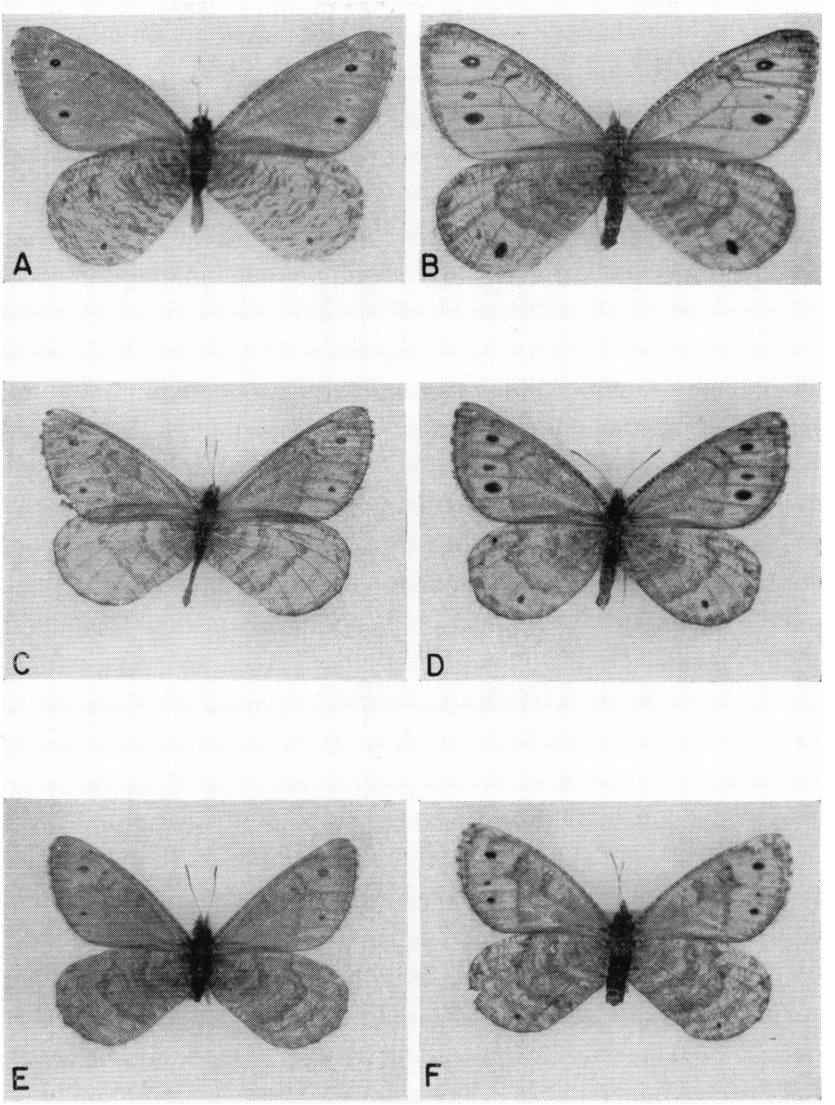

FIG. 9. Upper sides of typical specimens of *Oeneis alberta*. A, B. *O. alberta daura*. A. Male, Williams and Paradise creeks, near McNary, White Mountains, Arizona, June 7, 1935 (D. K. Duncan). B. Female, same data as for male A. C, D. *O. alberta oslari*. C. Male, Crooked Creek, near Fairplay, Park County, Colorado, 9800 feet, June 11, 1951 (F. M. Brown). D. Female, same data as for male C. E, F. *O. alberta alberta*. E. Male, Lloydminster, Saskatchewan, May 20, 1948 (R. J. Fitch). F. Female, same locality as for male E, but dated May 28, 1948.

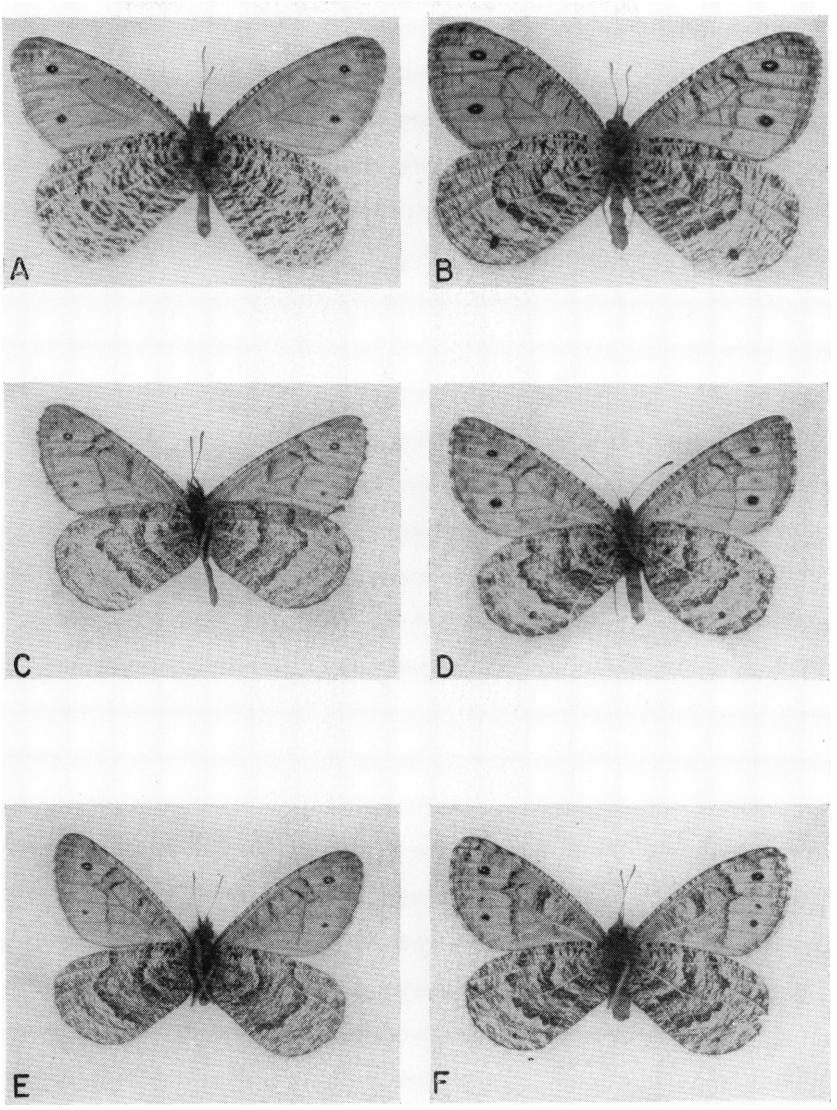

FIG. 10. Under sides of specimens shown in figure 9.

oslari Skinner:

Color differs from that of *daura* but not of *alberta*.

Size smaller than that of *daura*, males may be a little larger than those of *alberta*.

Maculation not distinctive.

Limbal band possibly differs from that of both *daura* and *alberta*.

Limbal line in males differs from that of *daura*, in females differs from that of *alberta*.

Median band differs from that of *daura* but not of *alberta*.

Male genitalia possibly differ from those of *daura* but not from those of *alberta*.

alberta Elwes:

Color differs from that of *daura* but not of *oslari*.

Size smaller than that of *daura* but not significantly different from that of *oslari*.

Maculation not distinctive.

Limbal band differs from that of *daura* and possibly from that of *oslari*.

Limbal line in females significantly different from that in the other subspecies.

Median band differs from that of *daura* but not of *oslari*.

Male genitalia possibly different in minor detail from those of *daura* but not of *oslari*.

On the basis of the limited material before me I am quite satisfied that *daura* is a distinctive subspecies. I cannot say the same for *oslari* and *alberta*. The latter seems to be a little smaller and a little more boldly marked than is *oslari*. Until the geographic gap between the known ranges of these two is adequately explored we will not know if there is a real discontinuity as great as the one now supposed to exist. Now that we know that *oslari* is, like *alberta*, an insect of the grasslands it is imperative that the "hogback" country of Wyoming and Montana be searched in May and early June for the insect. This is an area almost devoid of local collectors. The species flies too early for it to be caught by the normal summer transient collectors. Until I have further information I shall reserve judgment on the status of *oslari*, but I am inclined to consider it a synonym of *alberta*.