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A NEW SUBSPECIES OF *SPEYERIA ATLANTIS* (NYMPHALIDAE) FROM SOUTH-CENTRAL NEW MEXICO

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Introduction

Ferris (1983) reviewed the *Speyeria atlantis* (W. H. Edwards) complex in the southern Rocky Mountains. The subspecific names available for that region are *nikias* (Ehrmann), *electa* (W. H. Edwards), *hesperis* (W. H. Edwards), and *ratonensis* Scott. The area covered by the Ferris review includes Colorado, southern Wyoming and north-central New Mexico. My intent here is to complement geographically the Ferris study.

South and west of the Rocky Mountains in New Mexico, *s. atlantis* populations exist on the higher mountains separated by lowland desert barriers. Biologically, such areas are essentially islands (Fig. 1). Grey (1951) indicated that "island" *s. atlantis* populations "have little in common with the Rocky Mountain phenotypes".

There is scant endemism on any given New Mexico mountain range. This implies that the lowland desertification in recent geologically (Holland, 1984). One exception is the Capitan-Sacramento mountain complex in the south-central part of the state, where the isolation may be older. Several butterfly populations here are distinct, at least at the subspecific level. Endemics to these mountains include *Occidryas anicia cloudercrofti* Ferris and R. Holland (1980), an *Eriogonum*-feeding *Callophrys apama* (W. H. Edwards) unnamed subspecies, possible undescribed subspecies of *Glaucopsyche lygdamus* (Doubleday), *Icaricia icarioides* (Boisduval) and *Callophrys sheridanii* (W. H. Edwards), and the new *Speyeria atlantis* (W. H. Edwards) subspecies described here.

A faunal survey of the south-central New Mexico mountains is nearly ready for publication (Holland and Cary, in prep.). Part of the reason for describing this new subspecies at this time is to make names available for the butterflies know to occur commonly in this region.

Evaluation of Characters

For quantitative evaluation of New Mexico *s. atlantis* populations, two characteristics were selected for study: right forewing length measured with a caliper to the nearest half mm, and extent and contrast of basal background suffusion on the dorsal wing surfaces based on grading from 0 to 5 with benchmark specimens shown in Fig. 2. Grading was by contrast, not overall dorsal surface darkness.

Student's *t* test for significance of difference was then applied to the data in Tables 1 and 2, except that the Sandia and Manzano populations were combined.

Review of Named Subspecies

The presently available subspecific names for *Speyeria atlantis* subspecies south of the Rocky Mountains in New Mexico are *s. a. nausicaa* (W. H. Edwards) and *s. a. dorothea* Moeck (Fig. 3). The *nausicaa-dorothea* group is immediately separable from the Rocky Mountain subspecies on the basis of size. *S. a. nausicaa* and *s. a. dorothea* are larger even than *nikias*, the subspecies from the New Mexican Jemez Mts. extension of the Rocky Mts. (see Fig. 3, Tables 2 and 3). *S. a. nausicaa* is larger and more reddish than *s. a. dorothea* (Tables 2 and 3). Also, the basal portion of the dorsal wing surfaces are significantly less darkened in *nausicaa* than *dorothea* (Tables 1, 3). These two subspecies might form a cline if their distribution were continuous instead of restricted to high mountains. One pole of the cline would be the Sandia and Manzano Mts. near Albuquerque. The Sandia Mts. are the *dorothea* type locality. The other pole is less clearly defined, but would probably be near Mt. Graham, Arizona, which is the *nausicaa* type locality. Some mountain ranges, especially Mt. Taylor and the Chuska Mts., support intermediate populations.

The *nausicaa-dorothea* concepts are inadequate for populations in the Capitan-Sacramento mountain complex. Specimens from the latter area are significantly smaller than *s. a. dorothea* and *s. a. nausicaa* (Tables 2 and 3). Most specimens of *dorothea* and especially of *nausicaa* have the basal portions of the dorsal surfaces of both wings not greatly darker than the distal portions (Table 1, 3). The Capitan and Sacramento Mts. populations (Fig. 4, Tables 1, 3), on the other hand, nearly always have the basal portions of the dorsal surface of both wings darker than the distal portion. This feature, the hallmark of the new subspecies, is most pronounced in Capitan Mts. specimens (Tables 1, 3). The Capitans are thus the appropriate range from which to select the type series for the south central New Mexican subspecies.

Speyeria atlantis capitanensis, new subspecies

Male. Length of forewing (n=32) 29.5 to 34.5 mm (\bar{x} =32.2, s_x =1.42). Similar to subspecies *dorothea* and *nausicaa* except as follows. Dorsal wing surfaces dominated by extreme basal chocolate suffusion nearly as dark as fuscous markings and tending to obscure them. Basal suffusion typically extends over half of wing length. Suffusion slightly lighter in forewing cell. Edge of suffusion gradual, not abrupt. Fuscous markings not enlarged, and outer third of wings without fulvous background darkened. Ventral surfaces are not remarkable; hind wing spots completely silvered except for two or three at the anal angle.

Female. Length of forewing (n=16) 33.0 to 39.0 mm (\bar{x} =35.0, s_x =1.77). Similar to male, except basal chocolate suffusion more limited, usually to less than one-third of dorsal wing length. All spots on ventral hind wing silvered.

Types. HOLOTYPE: male (Fig. 4), Padilla Point, crest of Capitan Ridge, Capitan Mts., Lincoln Co., NM, 10 July 1982, 9200' (R. Holland). ALLOTYPE: female (Fig. 4), radio towers at summit of Capitan Ridge, Capitan Mts., Lincoln Co., NM, 20 July 1980, 10,000' (J. McCaffrey). Types deposited in the American Museum of Natural History, as are specimens in Figures 2 and 3. PARATYPES: 31 males and 15 females. Disposition as follows: two ♂♂ and one ♀ (A, C and H in Figures 2 and 3) to the American Museum of Natural History; one pair each to the Los Angeles County Museum (Natural History), the U.S. National Museum of Natural History and the Allyn Museum of Entomology; one pair to C.D. Ferris; 26 males and 10 females retained by R. Holland.

Records: New Mexico, LINCOLN CO., Capitan Mts.; Padilla Point, crest of Capitan Ridge, 10 July 1982, 9200' (R. Holland) 6 ♂♂; 2 mi. W. of summit (radio towers) of Capitan Ridge, 13 July 1980, 9500' (R. Holland) 9 ♂♂ and 5 ♀♀; trail from summit (radio towers) of Capitan Ridge to Capitan Peak, 14 July 1980, 9500' (R. Holland) 7 ♂♂ and 6 ♀♀; summit (radio towers) of Capitan Ridge, 11 July 1982, 10,000' (R. Holland) 3 ♂♂; same locality, 4 July 1982, (R. Holland) 3 ♂♂ and 1 ♀; same locality, 20 July 1980 (J. McCaffrey) 2 ♀♀; 7 mi. up Copeland Can. from NM 48, N. slope, 5 July 1981, 8,000' (R. Holland) 3 ♂♂; same locality, 21 June 1980 (R. Holland) 1 ♂. Material close to this subspecies

has also been taken in the Sacramento Mts. of Lincoln and Otero Cos., NM, quite commonly at most moist upland meadows between 7,000' and 10,000'.

Geographic Distribution of Phenotypes

The Sacramento Mts. population of *s. atlantis* is statistically distinct from topotypical *capitanensis*, but not so much as to merit a different name (Table 3). Manzano Mts. populations are *s. a. dorothea*. The Mt. Taylor and Chuska Mts. *s. atlantis* lack the reddish aspect of *s. a. nausicaa*, but Chuska specimens, like *nausicaa*, show dorsal wing surfaces almost without dark basal suffusion. Phenotypically, they are *dorothea-nausicaa* intermediates nearer *dorothea* (Table 3). The Magdalena and San Mateo Mts. populations are also *nausicaa-dorothea* intermediates which approach *nausicaa* (Table 3), although they lack the *nausicaa* redness. Gila Mts. specimens are clearly *s. a. nausicaa*. The Zuni Mts. apparently have the proper habitat to support *s. atlantis*, but the species has not been collected there. This makes the Zuni Mts. unique among the uplands of New Mexico.

The similarity in size (Table 3) between Jemez Mts. *s. a. nikias* and Sacramento Mts. nr. *capitanensis* populations may either be due to chance or convergent evolution, but almost certainly does not reflect a close affinity. On the other hand, the similarity in contrast between the Jemez Mts. *s. a. nikias* and several geographically proximate populations near *s. a. dorothea*, especially the Mt. Taylor one, might conceivably indicate more recent isolation or some gene flow.

Acknowledgements

I have been given Sacramento Mts. material from G.S. Forbes, G.A. Gorelick and J. McCaffrey. J. McCaffrey also contributed type material from the Capitan Mts. C.D. Ferris donated *s. nausicaa* material. He also provided preprints of his Rocky Mountains study so this work would complement his.

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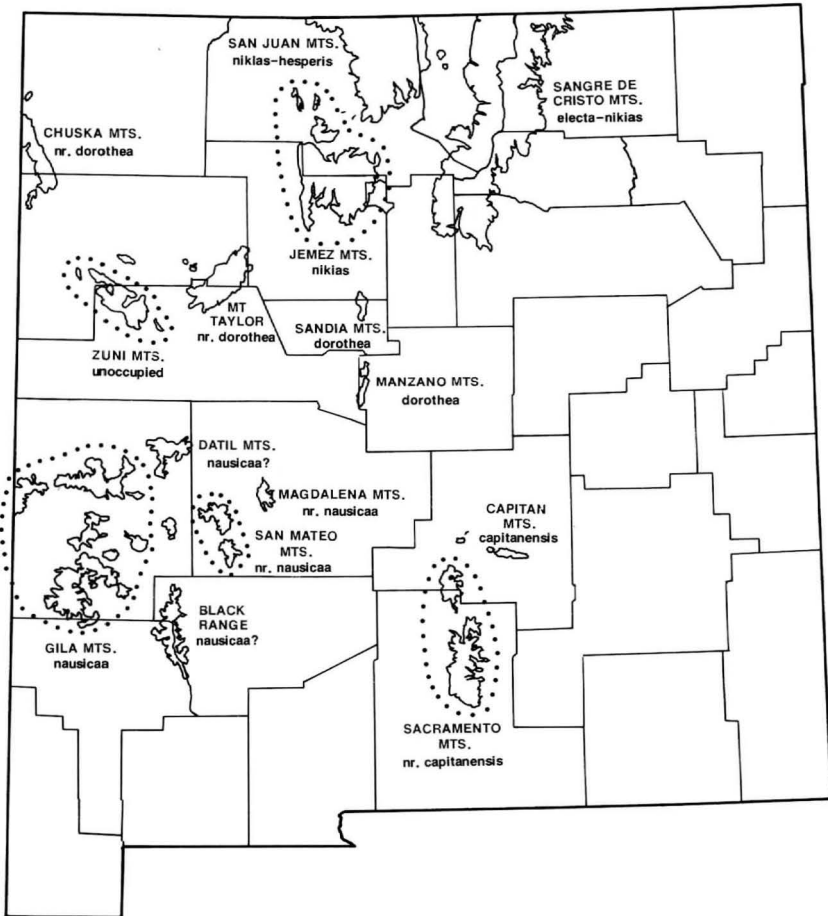


Figure 1. The major mountain ranges of New Mexico, showing 8000' contours.

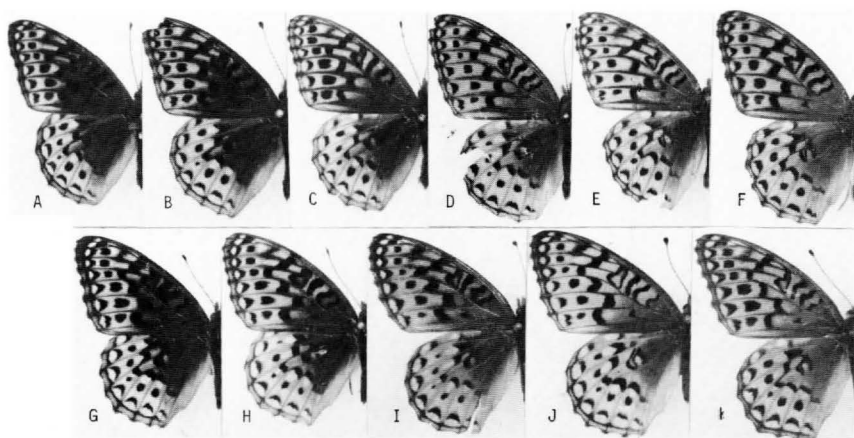


Figure 2. Benchmark *Speyeria atlantis* used for basal suffusion extent and contrast standards. Top, males: A, Grade 5, trail from summit (radio towers) of Capitan Ridge to Capitan Pk., Capitan Mts., Lincoln Co., NM, 14 July 1980, 9600' (RH); B, Grade 4 (holotype of *s. a. capitanensis*), Padilla Pt., Capitan Mts., Lincoln Co., NM, 10 July 1982, 9200' (RH); C, Grade 3, 2 mi. W. of summit (radio towers), Capitan Mts., Lincoln Co., NM, 14 July 1980, 9500' (RH); D, Grade 2, Capilla Pk., Manzano Mts., Torrance Co., NM, 1 July 1967, 9000' (RH); E, Grade 1, 2 mi. SE of Cove, Chuska Mts., Apache Co., AZ, 23 July 1978, 8000' (RH); F, Grade 0, Cherry Cr., Gila Mts., Grant Co., NM, 5 July 1976, 7100' (CDF). Bottom: females: G, Grade 4 (allotype of *s. a. capitanensis*), radio towers at summit, Capitan Mts., Lincoln Co., NM, 20 July 1980, 10,000' (JM); H, Grade 3, radio towers at summit, Capitan Mts., Lincoln Co., NM, 20 July 1980, 10,000' (JM); I, Grade 2, 6 mi. N of South Sandia Pk., Sandia Mts., Bernalillo Co., NM, 6 August 1966 (RH); J, Grade 1, Tsaile Cr., Chuska Mts., Apache Co., AZ, 20 July 1974, 7500' (RH); K, Grade 0. Water Can., Magdalena Mts., Socorro Co., NM, 24 July 1971, 9400' (RH).

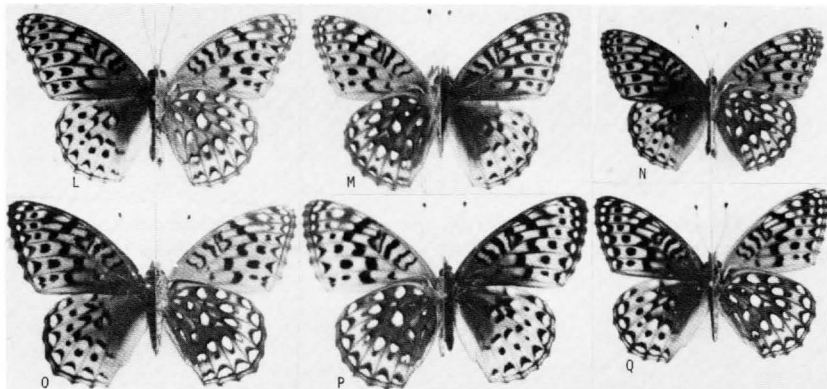


Figure 3. Previously described *Speyeria atlantis* subspecies of New Mexico. Top: males, dorsal and ventral sides; L, *s. a. nausicaa*, Cherry Ck., Gila NF, Grant Co., NM, 5 July 1976, 7100' (CDF); M, *s. a. dorothea*, New Can. CG, Manzano Mts., Torrance Co., NM, 8 July 1967, 8000' (RH); N, *s. a. nikias*, Agua Sarca, nr. Mesa Puleo, Jemez Mts., Rio Arriba Co., NM, 12 July 1984, 8000' (RH). Bottom: females, dorsal and ventral sides; O, *s. a. nausicaa*, Cherry Ck., Gila NF, Grant Co., NM, 5 July 1976, 7100' (CDF); P, *s. a. dorothea*, Capulin CG, Sandia Mts., Sandoval Co., NM, 23 July 1966, 8300' (RH); Q, *s. a. nikias*, 1 mi. N of Chicoma Mt., Jemez Mts., Rio Arriba Co., NM, 15 July 1983, 10,500' (RH).

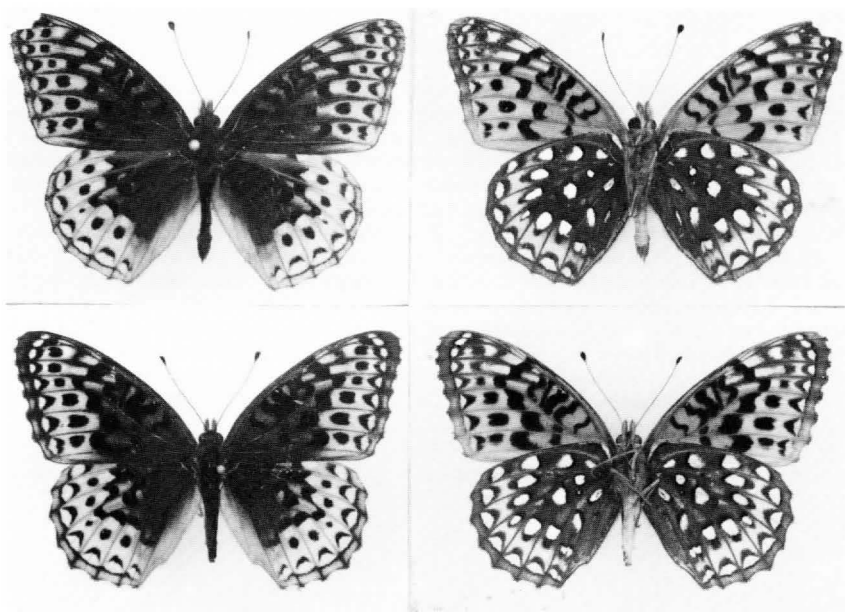


Figure 4. Types of *Speyeria atlantis capitanensis*, n. ssp. Top: dorsal and ventral sides of holotype, male. Bottom: dorsal and ventral sides of allotype, female.

Table 1. Statistics of contrast grade for basal suffusion for various *Speyeria atlantis* populations.

	n	Score Range	Mean	St. Dev.
Gila Mts. & Mt. Graham (<i>nausicaa</i>)				
males	7	0-2	1.42	.78
females	6	1-2	1.66	.51
San Mateo Mts. (nr. <i>nausicaa</i>)				
males	12	0-2	1.00	.85
females	10	1-2	1.40	.51
Magdalena Mts. (nr. <i>nausicaa</i>)				
males	15	0-2	1.26	.59
females	16	0-3	1.62	.88
Chuska Mts. (nr. <i>dorothea</i>)				
males	21	1-2	1.85	.35
females	12	1-3	1.83	.57
Mt. Taylor (nr. <i>dorothea</i>)				
males	24	2-3	2.54	.51
females	26	1-3	2.23	.58
Sandia Mts. (<i>dorothea</i>)				
males	4	2-3	2.50	.51
females	5	2	2.00	.00
Manzano Mts. (<i>dorothea</i>)				
males	16	2-3	2.43	.51
females	8	2-3	2.62	.51
Jemez Mts. (<i>nikias</i>)				
males	28	2-4	2.71	.53
females	6	1-3	2.16	.98
Sacramento Mts. (nr. <i>capitanensis</i>)				
males	15	3-4	3.26	.45
females	20	2-4	3.10	.55
Capitan Mts. (<i>capitanensis</i>)				
males	32	3-5	3.75	.57
females	16	3-4	3.37	.50

Table 2. Statistics of forewing length of various *Speyeria atlantis* populations.

	n	Range	Mean	St. Dev.
Gila Mts. & Mt. Graham (<i>nausicaa</i>)				
males	7	34.0 - 38.0	35.7	1.25
females	6	36.0 - 39.5	38.1	1.43
San Mateo Mts. (nr. <i>nausicaa</i>)				
males	12	32.0 - 37.0	34.4	1.63
females	10	33.5 - 39.0	37.0	1.59
Magdalena Mts. (nr. <i>nausicaa</i>)				
males	15	32.0 - 39.0	34.8	2.25
females	16	35.0 - 40.5	37.6	1.79
Chuska Mts. (nr. <i>dorothea</i>)				
males	21	29.5 - 36.0	33.1	1.58
females	12	32.0 - 38.5	35.5	1.99
Mt. Taylor (nr. <i>dorothea</i>)				
males	23	30.0 - 36.0	32.9	1.57
females	26	32.5 - 38.5	35.8	1.54
Sandia Mts. (<i>dorothea</i>)				
males	4	31.0 - 33.5	32.3	1.31
females	5	35.0 - 36.5	35.9	0.54
Manzano Mts. (<i>dorothea</i>)				
males	16	32.5 - 35.5	33.8	0.81
females	8	32.5 - 37.5	34.6	1.86
Jemez Mts. (<i>nikias</i>)				
males	28	27.5 - 31.5	29.7	1.05
females	6	31.5 - 33.0	32.1	0.51
Sacramento Mts. (nr. <i>capitanensis</i>)				
males	15	27.0 - 31.5	29.5	1.36
females	20	30.0 - 35.0	33.0	1.50
Capitan Mts. (<i>capitanensis</i>)				
males	32	29.5 - 34.5	32.2	1.42
females	16	33.0 - 39.0	35.0	1.77

Table 3. Statistical significance of forewing length difference and contrast (numbers in parentheses: probability that the difference is due to chance alone) for various *Speyeria atlantis* populations.

	San Mateo	Magdalena Mts.	Chuska Mts.	Mt. Taylor	Sandia-Manzano	Jemez Mts.	Sacramento Mts.	Capitan Mts.
Gila Mts.-Mt. Graham (<i>nausicaa</i>)								
males	.1(.3)	.3(.6)	< .005(.05)	< .005(< .005)	< .005(< .005)	< .005(< .005)	< .005(< .005)	< .005(< .005)
females	.2(.3)	.8(.9)	.01(0.6)	< .005(.02)	< .005(.01)	< .005(0.3)	< .005(< .005)	< .005(< .005)
San Mateo Mts. (nr. <i>nausicaa</i>)								
males		.6(.4)	.02(< .005)	.01(< .005)	.05(< .005)	< .005(< .005)	< .005(< .005)	< .005(< .005)
females		.2(.5)	.05(0.1)	.05(< .005)	.01(< .005)	< .005(.05)	< .005(< .005)	.01(< .005)
Magdalena Mts. (nr. <i>nausicaa</i>)								
males			.01(< .005)	< .005(< .005)	0.2(< .005)	< .005(< .005)	< .005(< .005)	< .005(< .005)
females			< .005(0.5)	< .005(.01)	< .005(< .005)	< .005(0.2)	< .005(< .005)	< .005(< .005)
Chuska Mts. (nr. <i>dorothea</i>)								
males				0.7(< .005)	0.4(< .005)	< .005(< .005)	< .005(< .005)	< .005(< .005)
females				0.6(0.5)	0.6(0.2)	< .005(0.4)	< .005(< .005)	0.5(< .005)
Mt. Taylor (nr. <i>dorothea</i>)								
males					0.1(0.6)	< .005(0.2)	< .005(< .005)	< .005(< .005)
females					.02(0.4)	< .005(0.8)	< .005(< .005)	0.2(< .005)
Sandia/Manzano Mts. (<i>dorothea</i>)								
males						< .005(0.1)	< .005(< .005)	< .005(< .005)
females						< .005(0.5)	< .005(< .005)	0.8(< .005)
Jemez Mts. (<i>nikias</i>)								
males							0.6(< .005)	< .005(< .005)
females							0.2(< .005)	< .005(< .005)
Sacramento Mts. (nr. <i>capitanensis</i>)								
males								< .005(.01)
females								< .005(0.1)

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