

BILATERAL GYNANDROMORPHIC *SPEYERIA*  
*DIANA* (NYMPHALIDAE)

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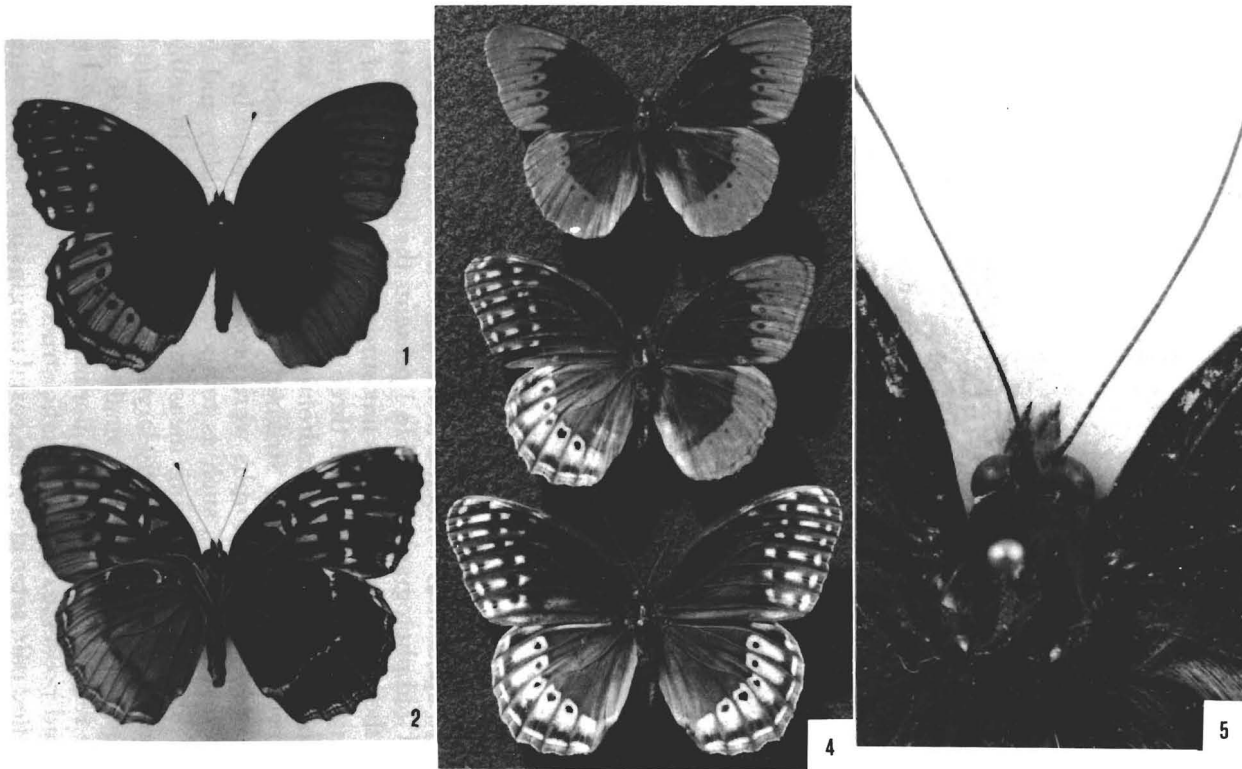
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**ABSTRACT.** Laboratory reared and field collected bilateral gynandromorphs of *Speyeria diana* are described. Comparisons are made with normal siblings of the laboratory reared gynandromorph and with normal specimens collected with the field caught gynandromorph. Development time of the laboratory reared gynandromorph was intermediate between those of normal male and female siblings. This may be linked with the fact that the male sides of both gynandromorphs were disproportionately large while the female sides were small.

A bilateral gynandromorph of the Diana Fritillary, *Speyeria diana* (Cramer), was reared by Showalter during September and October, 1973. This butterfly was one of 23 adults that developed from eggs obtained from a female taken 19 August 1973 in Poverty Hollow, Montgomery Co., Virginia. Initiation of larval feeding was induced by a method similar to that described by Mattoon, Davis, and Spencer (1971) and the larvae began feeding over a three-day period. Rearing temperature was 24°C. Adult emergence dates indicate that development time of the gynandromorph was intermediate between the development times of male and female siblings. Adult males emerged 2-7 days earlier than the gynandromorph ( $4.2 \pm 1.38$  days earlier [ $\bar{x} \pm s$ ]). The females emerged 2-7 days later than the gynandromorph ( $4.0 \pm 1.79$  days later). Pupation dates were not recorded but males generally pupated before females.

The gynandromorph appears to be perfectly bilateral with the right side male and the left side female. The color pattern of each side is normal compared to other *S. diana* specimens (Figs. 1 & 2). Externally, the genitalia are bilaterally asymmetrical with a misshapen clasper on the male side. The right eye (male) is larger than the left, measuring 3.4 mm dorsoventrally. The left eye measures 2.8 mm. The conical spines on the dorsal side of the pupa differ in shape (Fig. 3). The right spines are blunt like those of normal males and the left ones are more pointed like those of females.

An interesting fact about this butterfly is that the male side is larger than average for males; the female side is smaller than average for



FIGS. 1, 2, 4, 5. *Speyeria diana* gynandromorphs and normal individuals. 1, laboratory reared *S. diana* gynandromorph, upper side; 2, laboratory reared *S. diana* gynandromorph, under side; 4, field caught *S. diana* (from top), ♂, ♀, and gynandromorph (photograph by Glenn Berkey); 5, close-up of field caught gynandromorph *S. diana* (photograph by Glenn Berkey).

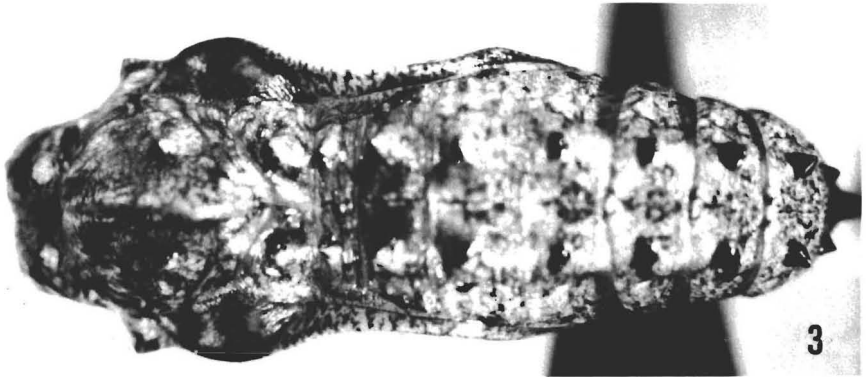


FIG. 3. Laboratory reared *S. diana* gynandromorph, pupa.

females. The male forewing is 48 mm long and the female forewing is 51 mm long. Clark & Clark (1951) say that the forewing lengths of male *S. diana* normally range from 43 to 47 mm while those of females range from 50 to 55 mm. Forewing lengths of siblings are given in Table 1 for comparison. The male side of the pupa was larger than the female side (Fig. 3). Normal male pupae are smaller than female pupae.

Thomas Allen of the West Virginia Department of Natural Resources field collected a bilateral gynandromorph *S. diana* near Pinnacle Creek, Wyoming Co., West Virginia on 12 July 1978 (Fig. 4). The seasonal range for *S. diana* in West Virginia extends from 13 June to 2 August. The gynandromorph, together with normal male and female specimens collected at the same time and location, was measured and photographed. Table 1 presents the largest diameter or length of the eye and wing radius measurements and the ratio of wing to eye lengths obtained from the three West Virginia specimens.

The laboratory reared gynandromorph and the slightly smaller field collected specimen are strikingly similar. Size variations between the two gynandromorphs were probably influenced by differing environmental factors such as temperature, humidity and availability of food. Eye and wing measurements of the field collected gynandromorph are only slightly larger than normal for the male half, while the female side is much smaller than normal. In both specimens, the left half is female with normal markings, and the right half is male and possesses male genitalic structures. The male sides feature modified pale setae along the costal margins of the dorsal surfaces of the hindwings which may be scent scales or androconia (Fig. 5). Unlike the male hindwing of the laboratory reared specimen, the field

TABLE 1. Eye and wing measurements and wing:eye ratios of laboratory reared and field collected *Speyeria diana*.

	Eye length (mm)	Wing radius (mm)	Wing:eye ratio
Reared specimens			
Males	—	44.9 ± 1.2(16) <sup>1</sup>	—
Females	—	54.0 ± 2.2(5) <sup>1</sup>	—
Gynandromorph			
Male half	3.4	48	14.1
Female half	2.8	51	18.2
Field collected specimens			
Male	3.1	44.1	14.2
Female	3.1	52.3	16.9
Gynandromorph			
Male half	3.2	45.2	14.1
Female half	2.7	47.8	17.7

<sup>1</sup> Mean values ± standard deviation (numbers in parentheses = sample size).

collected gynandromorph has the normal double row of rounded brown spots along the orange band of the dorsal wing surface, and the left front wing has a chip on cell Cu<sub>2</sub>. Results in Table 1 indicate that normal male and female specimens from West Virginia fall within the range of wing sizes obtained from laboratory reared specimens. The ratios of wing to eye measurements are fairly consistent between normal and gynandromorph specimens.

The female sides of both gynandromorphs are smaller than those of normal females, and the male sides are either equal to or larger than normal male specimens. Rearing data shows that males eclose approximately 8 days before females. If it is also true that males pupate earlier than females and that gynandromorph pupation occurs at an intermediate time, then these size differences are not surprising and could be due to the length of the larval feeding period. What triggers the behavioral change from that of feeding to that of seeking a pupation site is not known, but probably has a genetically controlled endocrinological basis modified by environmental conditions. The physiological relationships between the two sides of the gynandromorphs are not known, and thus we are unable to conclude from the available evidence how these developmental factors caused the disproportionate dimensions in the strikingly dimorphic *Speyeria diana* gynandromorphs.

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