Journal of the Lepidopterists' Society
36(2), 1982, 83–86

DYSSTROMA HERSILIATA FORM "MIRANDATA"—A RECESSIVE COLOR FORM (GEOMETRIDAE)

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ABSTRACT. Two successive generations of *Dysstroma hersiliata hersiliata* (Gn.) and *Dysstroma hersiliata* form "mirandata" (Tayl.) have been successfully reared in the laboratory. The results of selective matings have shown that *D. hersiliata* form "mirandata" is homozygous for a recessive color form of *D. hersiliata hersiliata.* Rearing and overwintering techniques are described.

Dysstroma hersiliata hersiliata was originally described by Guenée in 1857 and *D. h.* form "mirandata" by Taylor in 1910. Distinct differences between the two can be seen in the color of the median and antemedian bands. Specimens of *D. hersiliata* have a dark grey median band and a deep orange-yellow antemedian band with paler inner and outer margins; those of *D. h.* form "mirandata" have a yellow-brown median band with dark grey costal edge and an antemedian band which is a slightly darker orange-yellow than that of *hersiliata. Dysstroma h.* form "mirandata" is similar to *D. h. cervinifascia* (Wlk.) except for the antemedian band which in *cervinifascia* appears as a dark greyish yellow-brown band with a yellow-brown median margin.

Dysstroma hersiliata cervinifascia and *D. h.* form "mirandata" seem to have the same geographic distribution as *D. hersiliata,* in fact a collection made at Mistassini, Quebec by J. R. McGillis on 8 August 1956, have turned up *hersiliata, h. cervinifascia* and *h.* form "mirandata" specimens. The male and female genitalia of the above 3 all appear to be similar, which indicates a strong possibility that *h. cervinifascia* may be just another color form of *hersiliata* as well. Future rearings may prove or disprove this.

MATERIALS AND METHODS

Two adult females, one *D. hersiliata hersiliata* and one *D. hersiliata* form "mirandata" were captured 5 July 1978 at Dunrobin Ontario by Dr. Eugene Munroe. These were placed in individual 32 oz waxed cardboard containers in which gooseberry foliage and a vial of sugar water with a cotton wick were placed. After the females had died, all the eggs were placed on a piece of #40 nylon mesh over damp vermiculite in 8 oz clear plastic containers. The eggs were stored outdoors in a screened, shaded building until 10 October 1978, when the containers were placed in plastic bags and buried approximately 22.5 cm (9 inches) underground among gooseberry plants and left to

overwinter. On 19 April 1979, as the buds of the gooseberry were beginning to open, the eggs were removed from the ground, brought in to room temperature and placed in 8 oz plastic containers lined with damp tissue paper. After hatching, the larvae were placed into groups of 10 in 8 oz plastic containers with gooseberry foliage. Each resulting pupa was placed in individual 2 oz plastic vials with a small piece of damp wick. Soon after the moths emerged and their wings had dried they were placed in pairs in 32 oz waxed cardboard containers and set up in the same manner as the original parental rearing.

Twelve pairs were placed together for mating. The resulting eggs, larvae and pupae were prepared and cared for in the same manner as previously described.

One of the most difficult aspects of rearing this *Dysstroma* species was overwintering the eggs successfully. Several previous attempts to overwinter eggs for varying lengths of time in a refrigerated environment had failed. However, the eggs were successfully overwintered when buried in the ground. In the Ottawa area the ground in the winter of 1978–79 had a good snow cover for most of the winter; whereas, the ground in the winter of 1979–80 was bare for most of the season, resulting in deep frost penetration. This may have influenced the percentage of eggs which hatched successfully in the two winters; approximately 44% in 1978–79 and approximately 20% in 1979–80. Water did seep into the containers while they were buried in the ground both years, despite precausions taken against this; nevertheless, the eggs still hatched successfully. The humidity in the refrigerated environment was probably much too low, causing the previous failures.

RESULTS

By 10 July 1978 the original wild female *D. hersiliata* (79-1) had laid 40 eggs and the female *D. h.* form "mirandata" (79-2) 75 eggs. The eggs were laid singly, loosely attached to the foliage and bottom of the container. By 25 April 1979, 290 days later, 31 larvae of 79-1 and 58 larvae of 79-2 had hatched. By 4 June 1979, 36 days later, all adults of the F1 generation had emerged. The 79-1 stock produced 13 male and 10 female *hersiliata* offspring, (100% *hersiliata*), while 79-2 produced 11 male and 13 female *hersiliata*, as well as 10 male and 18 female "mirandata" offspring, (46% *hersiliata* and 54% "mirandata"). Of the 12 F1 generation matings, 7 were successful in producing F2 offspring. These are listed in Table 1.

There were only 2 distinct color forms from these crosses with no intermediates.

TABLE 1. Results of selective matings between *Dysstroma hersiliata* and *D. hersiliata* form "mirandata."

Number	Parent F1		Number of eggs	Offspring F2		%
	Male	Female		*hersiliata*	"mirandata"	*hersiliata*
1	*hersiliata* 79-1	*hersiliata* 79-2	30	5 female 5 male		100%
2	*hersiliata* 79-2	*hersiliata* 79-1	19	4 female 2 male		100%
3	*hersiliata* 79-1	"mirandata" 79-2	176	15 female 19 male	9 female 25 male	50%
4	*hersiliata* 79-2	*hersiliata* 79-2	25	1 female	1 male	50%
5	"mirandata" 79-2	"mirandata" 79-2	45		13 female 11 male	0%
6	*hersiliata* 79-2	*hersiliata* 79-2	23	2 female 2 male		100%
7	*hersiliata* 79-2	*hersiliata* 79-2	41	2 male		100%

CONCLUSION

The wild female *D. h.* form "*mirandata*," 79-2, produced both *hersiliata* and *h.* form "mirandata" offspring demonstrating that the two are color forms of the same species. If one assumes that "mirandata" is the recessive color form, and judging by the 46% *hersiliata* and 54% "mirandata" F1 generation 79-2 produced, then one of the partners of 79-2 would have been homozygous for the recessive color characters, aa, while the other partner would have been heterozygous, Aa (aa × Aa). The wild female *hersiliata*, 79-1, produced only *hersiliata* offspring. If one assumes that *hersiliata* is the dominant color form then the partners of 79-1 could have been only two possible combinations, judging by the 100% *hersiliata* F1 generation that was produced. Either both partners were homozygous for dominant color characters, AA and AA, or one partner was homozygous, AA, and the other heterozygous, Aa (AA × AA or Aa × AA). In pair number 3 of the F1 matings a male *hersiliata* offspring from 79-1 was mated with a female "mirandata" offspring from 79-2. Since 50% of the F2 generation was *hersiliata* and 50% "mirandata," the F1 generation of 79-1 probably resulted from an Aa × aa mating, producing 50% of the F1 generation of 79-1 heterozygous and 50% homozygous for the recessive color form (Aa or aa). If the male of 79-1 had been homozygous for the dominant color character then all the F2 generation of the number 3 F1 mating would have been as the *hersiliata* color form.

In pair number 5 of the F1 matings a male and female "mirandata" of 79-2 were mated. All of the F2 generations were the "mirandata" color form as would be expected if "mirandata" is the recessive form. I therefore conclude that typical *D. hersiliata* is a dominant color form and that *D. h.* form "mirandata" a recessive color form.

LITERATURE CITED

BARNES, W. & J. MCDUNNOUGH. 1912. Notes on Taylor's types of Geometridae. Can. Entomol. 44:274.

DYAR, H. G. 1904. The Lepidoptera of the Kootenai District of British Columbia. Proc. U.S. Nat. Mus. 27:136.

FORBES, W. T. 1948. Lepidoptera of New York and Neighboring States, 2. Mem. Cornell Univ. Agric. Exp. Stn., No. 274:136.

ITAMIES, J. 1971. Variations in some geometrid moths (Lep. Geometridae) in Rauma in the years 1967–1970. Ann. Entomol. Fenn 37(4):195–202.

KELLY, K. L. 1965. ISCC-NBS Color name charts illustrated with centroid colors. Supplement to Natl. Bur. Standards Circ. 553. Washington, D.C.

MCDUNNOUGH, J. 1927. The Lepidoptera of the Seton Lake region, British Columbia. Can. Entomol. 59:240.

——— 1939. New North American Geometridae with notes, 1 (Lepidoptera). Can. Entomol. 71:187–192.

——— 1943. Notes and descriptions of North American Geometridae. Can. Entomol. 75:215–216.

MORRIS, R. F. 1980. Butterflies and moths of Newfoundland and Labrador. The Macrolepidopter. Res. Br. Agric. Can. Pub. 1691.

MÜNTZING, A. 1961. Genetics: Basic and applied. Stockholm, Sweden.

SWETT, L. W. 1917. The genus *Dysstroma* Hübner. Can. Entomol. 49:64–72.