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Mobility in a Wyoming Population of Speyeria Atlantis as Determined by Tagging (Lepidoptera: Nymphalidae)

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MOBILITY IN A WYOMING POPULATION OF *SPEYERIA ATLANTIS* AS DETERMINED BY TAGGING (LEPIDOPTERA: NYMPHALIDAE)

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In my study of *Speyeria* distribution (Moeck, 1957; Grey & Moeck, 1962; Grey, Moeck & Evans, 1963) it was found desirable to determine the degree of mobility of the individuals in a population of *Speyeria atlantis* (Edwards). For this study I selected an isolated population of *atlantis* along a tributary of Horse Creek on the eastern slope of the South Laramie Range, some 17 or 18 miles northwest of Laramie. The specimens along this tributary were dark and well silvered, closely approaching the typical "appalachian" form in the Black Hills. This colony, furthermore, was the only population of *atlantis* found in about four parallel tributaries of Horse Creek. By the term "appalachian" Grey and I refer to the "parent stock" of the species, ranging in the East from the Maritime Provinces to West Virginia and westward toward the Great Lakes.

I divided the narrow tributary basin occupied by the population into nine areas, each approximately 1000 feet long. Specimens collected in these zones or areas were tagged with 1/4" pieces of colored plastic tape, which were placed on the costal margin of the right forewing. The specimens were released in the area where they were caught and tagged. A different color of tag was used for each area, and, to add to the validity of the study, I avoided tagging or collecting within a buffer zone of about 100 feet between the areas.

The original plan to tag an equal number of males and females in each area was found not feasible, so an effort was made to spend equal periods of time in each area each collecting day for collecting and tagging. Nine visits were made in the areas, from July 7 to July 26, 1966, inclusive, using every 2nd or 3rd day, weather permitting.

As Table 1 indicates, of the 165 specimens tagged and released, 85, or about 51 per cent, were retaken in a different area. The ratio of recapture of males and females is about the same. To retake over 50 per cent of tagged specimens is indeed an indication that the specimens moved very little. Table 2 indicates there was little linear movement from the point of capture and release. Sixty-seven of the 85 retaken were caught in the adjoining area, or a movement aver-

Table 1. Numbers of *Speyeria atlantis* tagged, released, and recaptured in a different area.

Sex	Released	Recaptured	Per Cent
Male	111	58	50 %
Female	54	27	52 %
Totals	165	85	51 %

aging about 1000 feet. Only 17, or 20 per cent, had moved two spaces or 2000 feet, and one lone male had moved into a third location or area.

Sixty-three, or 74 per cent, had drifted downstream, while only 22, or 26 per cent, moved upstream. The wind was apparently not a factor, at least not during my collecting periods. The stream winds its way from the southwest down towards the northeast, and the prevailing winds were from the northwest, thus crossing the stream at right angles.

I mentioned previously that retaking 51 per cent of tagged butterflies is a rather high percentage. These figures take no account of the large number of specimens continually seen in the same area where they had been released. When a specimen was spotted in its original area, no effort was made to capture it, and if one was taken by mistake, it was released and no record kept of it. That many specimens never moved out of the original area is indicated by the large number of times a given specimen was recognized by a peculiar tear of the wing, or by the fact that the tag had been placed at an odd angle. In one location a pair was taken *in copula*, both bearing the tag of the area where released.

The ratio of 54 females to 111 males would indicate that more males were present than females, but this was not necessarily so. I collected early in the day to take advantage of the sun before the afternoon clouds rolled in. It was noticed that at this time the males were feeding and easily caught, while many of the females were still resting and not noticed until disturbed by my walking through the grass, when they flew up and were more difficult to capture.

Table 2. Distance and direction traveled by individuals recovered outside of original tagging area.

Distance Moved	UPSTREAM Male	Female	Total[1]	DOWNSTREAM Male	Female	Total[1]	UP- OR DOWNSTREAM Male	Female	Total[1]
1 Area	14	4	18	29	20	49	43	24	67
2 Areas	3	-	3	11	3	14	14	3	17
3 Areas	1	-	1	-	-		1		1
TOTALS	18[2]	4[2]	22[3]	40[2]	23[2]	63[3]	58[2]	27[2]	85[3]

(NOTE 1: A Chi-square test of significance shows that the differences in distances traveled upstream, downstream, or in either direction, are highly significant ($P < .001$), i.e., the distances traveled are not randomly distributed or equal.)

(NOTE 2: A Chi-square test of significance does not reveal a significant difference in the proportion of males and females flying upstream, or in the proportion of males and females flying downstream, i.e., there does not appear to be a difference between the sexes in the direction flown (P between .1 and .2)).

(NOTE 3: A Chi-square test of significance shows a highly significant difference in the direction flown by both sexes combined ($P < .001$), i.e., significantly more butterflies were recaptured downstream than up.)

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Table 3. Origin of butterflies recovered outside of the area where they were originally tagged.

Origin Area	Male	Female	Total		Per Cent
A (top)	3	3	6		
B	3	1	4	19	22 %
C	5	4	9		
D	12	6	18		
E	15	3	18	54	64 %
F	11	7	18		
G	3	2	5		
H	4	1	5	12	14 %
I	2	-	2		
TOTALS	58	27	85		
per cent	32 %	68 %			

Table 3 reveals that 64 per cent of the tagged butterflies which were recaptured in another area came from the central third of the streambed, while the remaining 36 per cent originated from the apical thirds of the study area. This is to be expected, since a greater number of butterflies was tagged in the central third of the streambed, where the population was most dense.

On one or two occasions we had severe drenching rain storms, but when I returned a day or two later, I noted that these did not seem to affect the *Speyeria* specimens or their tags in any way.

SUMMARY

1. Of 165 specimens of *Speyeria atlantis* tagged in 1000-foot long sectors of an isolated Wyoming population, 85, or 51 per cent, were recaptured in a different sector, the ratio of recapture of males and females being exproximately the same.
2. No records were kept of specimens not leaving the area where tagged, but of the 51 per cent of the tagged individuals that had drifted, 79 per cent of those recaptured had moved not over 1000 feet, 20 per cent had moved about 2000 feet, and only one specimen had drifted over 2000 feet.
3. Of the individuals that moved from the area where they were tagged, 74 per cent had moved downstream, the remainder upstream.
4. Suggestions for future tagging venture: Each tag might have borne a number rather than a color (See technique discribed by Ehrlich & Davidson, 1960). Then just records could be kept, and specimens continually released again, because duplications could be accounted for. In this way, actual records could be kept of the number which did not move out of the original territory, or of movements, day after day, of the same specimen.

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[Since the above paper was set in type, Mr. A. H. Moeck has deposited specimens of each of the discussed *Speyeria atlantis* forms in the Entomology Museum, Michigan State University, E. Lansing, Mich. 48823. Ed.]

DEAD ALEWIVES AND BLACK BLOWFLIES DISCOURAGE BATHERS AT LAKE MICHIGAN BEACHES

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The alewife, *Pomolobus pseudo-harengus* (Wilson), became well known to visitors attending Lake Michigan beaches during 1967. The heavy mortality of this small fish (Fig. 1) in the spring and summer of that year caused piles and windrows of their bodies to form along the littoral drift line of many Lake Michigan beaches. The decaying bodies and accompanying fetid odor made conditions unpleasant for bathers and campers.

At Long Beach, Michigan City, Indiana, the black blow fly, *Phormia regina* (Meigen), (determined by R. J. Cagne, U.S. National Museum) was the principal insect associated with alewife decomposition. It caused an additional nuisance to bathers because of its habits. On the mornings of 10 and 11 June, fully developed maggots left the underside of the alewives and crawled over the sand. Those moving away from or parallel to the water burrowed into the sand near the alewives and pupated. However, most of those crawling toward the water became caught in the waves, so that by 10 a.m. (EST), when bathers began to arrive, many thousands of living and dead maggots were piled up in a narrow band along the water's edge. Although some of the maggots managed to crawl back to dry sand before noon and pupate, the majority were tumbled and piled by the waves throughout most of the day.

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