BUTTERFLIES AND HILLTOPS

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The recent discussion which has been carried on in the pages of this journal has surely served to show that there is a marked tendency for certain butterflies, particularly *Anthocaris midea* Hbn. (Arnhold, 1953) and several of the papilios, (Merritt, 1953; Guppy, 1953), to congregate on the tops of hills. On March 30, 1953, the author visited the top of Kennesaw Mountain near Marietta, Georgia, and observed there a remarkable assemblage consisting principally of *Anthocaris midea* and *Papilio marcellus* Cram. along with a smaller number of *Papilio asterius* Stoll. During the climb to the top of the peak isolated members of each of these species were observed flying steadily up the hill, following one of several more or less open routes to the summit. At the summit itself there were several hundred butterflies in an area of a few hundred square feet; the effect was much like a local snow flurry whirling about the peak. Although *A. midea* is generally rare or uncommon in this region, a dozen could be seen at a glance, all males and all fresh and active. The same was true of the more common *P. marcellus.* Dozens of fresh males and no females were seen. Two weeks after the first visit I returned to the Mountain and again found a large assemblage of butterflies at the summit. *A. midea* was still there, all males as before and now pretty well battered. The Papilios were still in good supply, and in addition many males of *Melitæa ismeria* Bdv. & Lec. in fresh condition were there.

The above observations when taken with previously published material seem to indicate two things. First, the congregations observed to date have been largely or exclusively of male butterflies. Second, the phenomenon is more widespread than heretofore indicated and is not confined to any particular group or family of butterflies. The explanation of these congregations has been the matter of considerable debate, and widely differing opinions have been offered. It seems fairly clear that since the groups are almost exclusively male, the underlying cause is not a search for food plant as suggested by MERRITT (1953). Indeed, on Kennesaw, at least, the food plants and females are found on the lower slopes or at the base of the mountain. For this reason ARNHOLD'S (1953) suggestion that the hill tops are the area in which the butterflies emerge either from hibernation or chrysalid seems unlikely. The wind has been suggested as the agent serving to concentrate the butterflies, and it seems that some such explanation may have merit although not precisely in the fashion that has been suggested.

BEALL (1953) suggests that the explanation may lie in a process of unidirectional flight, the butterflies moving slowly against the wind until they reach the crest of a hill where they are lifted up and carried back to begin the cycle anew. Although this explanation is interesting it involves the assumption of a tendency toward unidirectional flight in all the species in the congregation, and fails entirely to account for assemblages on still days.

A simpler explanation can be based on the normal thermal updrafts which are found on the sunny side of any slope, particularly an isolated one such as Kennesaw Mountain. During bright days, especially in the spring before the leaves are fully out, a slowly rising current of warm air will form and move up the sunny side of a hill as the result of heating the layer of air close to the ground. Such air movement is definite and measurable, but so subtle as to be overlooked in many cases. It seems reasonable that a butterfly moving at random could be carried up in such a gentle movement without recognizing the fact that it is drifting slowly toward the summit of the hill. Once at the summit the insect may either remain there as one of a large number similarly assembled, or it may continue in the warm current of air which as it rises and cools eventually becomes a falling current carrying the insect back to the base of the mountain. Thus the process may be a cyclic one in which the assemblage at the top of the hill has a shifting population constantly gaining new members from the lower levels while at the same time some individuals are rising up away from the summit to begin the long journey back to the base. That such a shift of population actually takes place is indicated by the fact that although new arrivals appear continuously the total number of individuals at the summit remains nearly constant. Such an explanation of congregations would lead us to expect that the greatest numbers would appear in the early afternoon hours of fairly warm and sunny days, when the thermal currents up the slopes are most highly developed. On windy days or in cloudy weather the effect would not be sufficiently strong to be observed. These ideas seem to be borne out by the author's observations on Kennesaw Mountain. In the mornings the population density at the summit was found to be little higher than that on lower slopes, while in the early afternoon the population density on the peak was much greater than that on the slopes below. On cloudy and/or windy days there was no marked tendency to congregate at the summit, even though plenty of butterflies were on the wing and the temperatures were in the high seventies.

The predominance of males in these assemblages is probably due to the difference in the flight pattern of the males and females. In their competitive search for females, the males may fly higher and be more prone to wander than the females, whose principal concern is the location of food plants and ovipositing.

In recapitulation, it is the author's suggestion that the congregation of butterflies on hill tops is due in large measure to the gentle mass flow of heated air up the sides of the hill together with the natural instinct to rove in search of females which is manifest in the males of certain species.

References

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