## COLIAS ACTIVITY IN NOVEMBER AND DECEMBER IN PENNSYLVANIA

## by Arthur M. Shapiro

In the past few years of collecting in and around Philadelphia, Pa., I have repeatedly observed and taken specimens of the Common and Orange Sulphurs (*Colias philodice* Latreille and *eurytheme* Boisduval) in the months of November and December, long after all butterflies save the hibernating nymphalids have disappeared. The circumstances surrounding the appearance of butterflies in so unlikely a season are quite interesting.

Both species of Colias are extremely abundant here, and as is usual for very numerous species it is fairly difficult to distinguish broods. There appear, however, to be four, centered in late April - mid May, late June – early July, late July – mid August, and September – early October. The late November – December specimens, while fairly numerous, do not approach in abundance even the smallest of these regular broods, that in early spring. Furthermore, they do not appear to be holdovers from the early fall brood. An occasional very worn specimen of either species has turned up as late as Nov.26, and these I unhesitatingly assign to the fourth generation. But the great majority of the late season specimens are very fresh. They consist largely of "ariadne"type eurytheme of both sexes, with some white females, and a considerably smaller number of *philodice*, both sexes, also with some white females. These specimens all show very heavily dusted hind wings beneath, and in the females above as well, with very narrow black borders in the males (especially reduced in *philodice*). The discocellular spot of the hind wing is very large and brightly colored in female eurytheme, and sometimes is enlarged in a "point" as in C. hecla. The specimens are generally small, and a few are quite diminutive. In general, they resemble very closely specimens taken in the month of April.

The appearance of these individuals in late fall coincides with the second or third day of a spell of milder, sunny weather. For example, in 1961: the September brood was definitely on the wane by October 29, with only a few, rather worn specimens taken. Despite unseasonably mild weather following, with a record-breaking 80°F. on November 5, only scattered, quite worn *Colias* were noted. After a brief cold spell

warm weather returned in the period from the 12th to the 16th, but only one specimen, again a worn one, was observed. An inch of snow fell on the night of the nineteenth. No specimens were observed from then until the 26th. It had been mild for two days, and on that date, with temperatures of 59°-32°, 17 fresh specimens were taken. These were the first fresh Colias taken since October 25. It got cold again the next day with the highest temperature for the week 50° on both the 2nd and the 3rd. On the first day two male eurytheme were taken, and on the following day, twelve specimens, consisting of three male and four female eurytheme, two male and one female philodice, and one white female of each. Again, all were quite fresh. Bad weather, but with continued mild temperatures, occurred for the next two days. The last captures for the season were made on Dec. 6. They consisted of four male eurytheme and two females, one of which was white. The overnight low for the 6th was 25° and despite a high of 45°, diligent searching failed to turn up any Colias on the 7th. Following that date the only mild temperatures have occurred during rainy spells, with all clear days quite cold and sub-freezing temperatures each night. No sign of butterfly life has been evident although the collecting area has been frequently examined.

All of these notes refer to one locality. The earliest fresh emergents of the fourth brood were noted there in early September, reaching their peak about Sept.23. This means that it is altogether possible that the offspring of these butterflies could be capable of emerging in late November or December. For example, in frequent breeding, the writer has observed that for C. eurytheme the average duration of each stage is as follows: egg, five days; larva, eighteen days; pupa, seven days. Of course, the emergence from the pupze is ordinarily delayed until spring. The only plausible explanation for the appearance of these butterflies is that they are in reality part of the same brood as those that will appear the following April from the overwintering pupe. That some of these pupæ may have developed to a fair extent during warm weather in October and early November, so that brief mild spells later on permit them to mature and emerge as butterflies, seems quite probable. The writer has taken Sulphurs as late as Dec.16, 1959 (the latest record known to me in the North) (temperatures  $62^{\circ}-36^{\circ}$ ). Any records of this sort, especially with information concerning the weather at and preceding the time of collection, would be appreciated by the writer.