

OBSERVATIONS ON THE LIFE HISTORY OF
CALEPHELIS BOREALIS. PART I.

by WORTH S. RANDLE

The author began his studies of the life history of *Calephelis borealis* in 1938, despite the fact that eminent authorities insisted then as now (Klots, 1951) that the *Calephelis* indigenous to southwestern Ohio must be *C. muticum* MCALPINE, not *C. borealis* GROTE & ROBINSON. Since the life histories have been described for *C. borealis* by DOS PASSOS (1936) and for *C. muticum* by MCALPINE (1938), there remains no reason for doubt of the presence of *C. borealis* in this area.

Subsequent to the author's first experiences with *C. borealis*, STEPHEN B. SMALLEY, science teacher in Cincinnati's Mt. Washington School and well-known lepidopterist in the area, undertook some studies of his own, and in 1950 both he and the author set out to collect more data on this interesting species. Gravid females were captured and induced to oviposit. Upon hatching, two sets of larvae were raised under separate conditions. Meanwhile the author made a series of observations on the life history of *C. borealis* in its natural habitat. The purpose of this paper is to present our observations in detail and to discuss comparisons of larval development in three different environments as a preliminary to future detailed studies of phases in the life-history of this insect.

DEVELOPMENT IN NATURAL CONDITIONS

In the literature on *Calephelis borealis* there is a paucity of information from the field. Mr. DOS PASSOS mentions the discovery of "six larvae found on plants as late as September 26th . . . quite small, rather dormant and apparently preparing to hibernate. However, only three of these could be found the following spring and they were dead."

On September 18, 1950, a fair day with a temperature of 80° F., the author found nine larvae of *C. borealis* on the underside of leaves of *Senecio obovatus* Muhl., and on the 26th four additional larvae were located. These larvae were in several positions on the leaves, but usually were found nearer the base of the spatulate part of the leaves, close to and parallel with the main vein. Two of the larvae had just molted and were eating exuviae, one had just finished eating most of its exuviae and was resting, and a fourth was very dark and almost ready to molt. A fifth larva was very white, in the first stage of molting. Their lengths were from 4 to 5.5 mm. which are the same measurements both DOS PASSOS and the author record for the fourth or fifth instars of artificially-raised specimens. All larval positions were marked and mapped, and a total of twenty-three visits were made to this marked area to study the development of *C. borealis*.

Growth of the larvae was very slow. On September 23 they measured 5 to 6.1 mm., and on this date one was found dead with minute beetles feeding on the remains. On September 26 with a high temperature of 68° four of the larvae could not be found. Two larvae were 7 mm. in length. On September 30 it was again a fair 80° day, and all larvae were back in their places.

The two larvae which measured 7 mm. on the 26th were reduced to 6.5 mm. and were very white. On October 4th these two had just molted, and one had already eaten the exuviae. Thus, four days elapsed from the time the larvae had voided preparatory to the molt and the completion of ecdysis. Eight larvae were missing on October 4 when the temperature registered a drop to a 41° low with a 56° high reading, and on the 5th with the same temperatures all but one were gone. This larva was observed as it moved to a point ten inches from its foodplant. It then disappeared while the author's back was turned, probably into some crevice in the earth, as it could not be located by overturning dead leaves. On the 11th the temperature was up again to 78°, but only one of the missing had reappeared in its place. Two of the larvae measured 7mm. x 2mm. and 8.5mm., x 2mm., the maximum dimensions recorded preceding hibernation. On this same date one larva was in the shrunken, very dark condition just previous to molting; and on the 14th it had molted and moved to another leaf of the same plant. On October 18 this larva, designated No. 13 in the records, had grown and was still up on the plant leaf. On the 21st No. 13 was still up on the plant, but in a brownish, shrunken, and inactive state. No. 10 was also back on its foodplant on this date and was also in a shrunken, dark, but still responsive condition. (By responsive is meant the raising of both posterior and anterior extremities at a slight touch, the usual reaction of *C. borealis*.) On October 30 No. 10 was found on the underside of a fallen leaf eight inches from its foodplant, and No. 13 was under a dead leaf three inches from its foodplant.

Both of these larvae were removed to a place near the base of a tree where they would easily be found and where they would be shielded from the high winds of early spring which might otherwise scatter them. On January 1, 1951, these two larvae were in the same positions as they were on October 30, with the same size and color. By this date they had been subjected to two weeks of temperature below 20° and two weeks under a two-inch blanket of snow. The winter months which followed were the second most severe in the history of Cincinnati. There was snow on the ground most of that season, at one time over a foot deep.

On the following April 8, a fair day with a high temperature of 50°, one of the larvae was found on a dead leaf four inches from where it was on January 1. On April 21, the first really warm spring day, with a temperature of 73° and a high wind, both No. 10 and No. 13 were found on the same leaf four inches from where the one was found on April 8. One measured 5.5mm. and the other 4mm.; they were brownish in color and responded slightly when touched by a grass stem. The larvae were on different leaves not far removed from each other on April 26. They were unchanged and in the same location on May 1 after six days of fair weather with high temperatures of 78° to 88°; there was no indication that they had been up on growing leaves, but they may possibly have nibbled at the bases of the petioles of *Senecio* leaves. Any feeding that they might have done up to this time would have been very meager because their size and color remained unchanged. Despite a drop in temperature to 53° on May 4, by May 5 the two larvae had become active. They had eaten to the upper cuticular membrane of new leaf-shoots, had molted once, and were now light in color and 6mm. in length. When found, however, both were down on ground leaves near their place of hibernation. On May 8 the two larvae measured 10mm. and 12mm. and had eaten

large chunks of the mature leaves, cutting from the margins almost in to the midrib. They were more amber in color than the hand-raised ones which matured in the fall and were found near the base of their foodplant under a dead leaf.

Three additional larvae were located on May 8. One was found in the same place where No. 8 had been before it had disappeared the previous fall, and one was in the place marked for No. 11. The third was 4 feet from where No. 3 had last been seen. No. 8 was in the first or white stage of molt. It was brought home on its leaf for observation and remained motionless for two days. On the 11th it molted and ate most of its exuviae. This larva descended only once to a dead leaf on the ground beneath its foodplant, but on another occasion it went to a basal, yellowish leaf of *Senecio*.

On May 12 both No. 10 and No. 13 were very white. Both measured 10 mm. One was under a dead leaf and the other under a basal leaf of the plant it had been feeding on. No. 3 measured 9 mm. and was found under a dead leaf. No. 11, also 9 mm., was three inches away from the plant on which it had been feeding when seen on May 8 and was under a dead leaf. When examined on May 15, No. 10 had just molted and had eaten part of the exuviae; it was under the same dead leaf as on the 12th and measured 12mm. No. 13 was up on a plant leaf, and its exuviae were found intact on the basal leaf where this larva had been on the 12th; it was 10 mm. long. No. 3 still measured 9mm.; it had molted, had eaten some of the exuviae, and had moved up to a leaf near the bottom of the foodplant. No. 11 was now 15 mm. in length and was on a *Senecio* leaf. Another larva, presumably No. 12, was found very near to No. 11 on a leaf of its plant and measured 11.5 mm.

A search of the marked area on May 24 disclosed only two larvae. There was no sign of the others anywhere near their foodplants. Nos. 3 and 12 were near their foodplants on undersides of dead leaves; they were shrunken and very white as if ready to pupate. On May 30, No. 12 was located on the underside of a very stout, dead leaf held up well above the earth by other dead leaves beneath it. The leaf was coated with silk, and a strand of silk was fastened around the shrunken and white larval body. After inspection this leaf was put back in place, although the exact plane of the leaf had not been noticed before it was moved. No. 3 had moved from its position of May 24 and could not be located nearby. When the author visited the study area again on June 3, he could not find No. 12. It had left its position of May 30 after being disturbed, just as had No. 3 also, even though it had been in advanced stage of transformation into the pupa. After a period of search a larva almost ready to pupate was found two feet away from where No. 3 was when examined on the 24th of May. It gave every appearance of being larva No. 3. It was placed in a jar and brought home and had transformed into a chrysalis by 9:30 P.M. The imago emerged on June 16 after a period of thirteen days in the pupal stage.

The habitat of the study area was a somewhat rocky, steep, north-south slope facing east. It consisted of very brushy pastureland, covered with Hawthorne, Pawpaw, various other saplings, briar, Honeysuckle, and Poison Ivy. It was located along the margin of a mature mixed-mesophytic woodland and

was about 250 feet distant from and about 35 feet above a permanent stream. In this location *C. borealis* was first discovered in 1937. Subsequently this butterfly was found by SMALLEY and the author in a few other widely separated places in the same type of habitat.

Records from the study area showed that the flying period for this latitude was from somewhat after the middle of June to somewhat after the middle of July. In 1950 and 1951 *C. borealis* was seen in numbers on June 27, and a few worn specimens were taken on July 28. Thus the total period in which imagoes were flying must have been a month and a half. Generally speaking, adults are inactive butterflies, sitting on leaves of weeds and shrubs for long periods of time basking in the sun with wings outstretched. The males are the more active, sometimes flying up in the air to dispute the intrusion of another male or some other winged insect. On two occasions the author watched individuals crawl around to the undersides of leaves when hard pressed and at other times they dropped low into the cover of vines on the ground or into tall grass. SMALLEY has observed imagoes on the underside of foliage on at least twelve occasions. Upon alighting they usually spread out their wings horizontally.

Careful observation of this area during all seasons indicated that *C. borealis* hibernated in the larval stage, probably in the sixth instar. Never was this insect seen flying before mid-June nor after the first week of August. No larvae of anywhere near pupating size were found in the fall.

(to be continued)

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ACTION ON NOMENCLATURE AT COPENHAGEN

The Colloquium on Zoological Nomenclature at Copenhagen, Denmark, which was arranged by the Secretary of the International Commission on Zoological Nomenclature (see *Lep. News* 7: p.32) was able to deal with the entire agenda of seventy items when it met in August just prior to the start of the Fourteenth International Congress of Zoology. THE OFFICIAL REPORT OF THE COLLOQUIUM IS BEING PUBLISHED IN BOOK FORM AND WILL BE AVAILABLE IN NOVEMBER. SUBSIDIZED IN ORDER TO PUT IT WITHIN REACH OF EVERY TAXONOMIST, THE PRICE WILL BE ONLY 75¢ (5 SHILLINGS). ORDERS WITH REMITTANCE MAY BE SENT IMMEDIATELY TO THE INTERNATIONAL TRUST FOR ZOOLOGICAL NOMENCLATURE, 41 QUEEN'S GATE, LONDON, S.W. 7, ENGLAND. Every taxonomist should have this important reference booklet.

The Copenhagen Congress, in unanimously adopting the Report, advised authors to apply the decisions to their work as soon as the Report is published, although these decisions will not formally come into force until they have been embodied in the revised International Code for which publication will necessarily require considerable time. Lepidopterists interested in nomenclature, and disturbed over the violent controversy which followed the 1948 Paris Congress, will be pleased to learn that the draft of the revised Code will be published in order to allow nomenclature specialists everywhere to review it very carefully before the final issuance of the revision.

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