

PANTHIADES M-ALBUM (LYCÆNIDÆ): REMARKS ON ITS
EARLY STAGES AND ON ITS OCCURRENCE IN PENNSYLVANIA¹

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About the only knowledge we have of the life history of *Panthiades m-album* (Boisduval & Leconte) we owe to JOHN ABBOT and the observations he made in Georgia nearly a century and a half ago.

From these observations we have brief superficial descriptions of larva and pupa, information that the larval food is oak and perhaps *Astragalus* also, and we learn that the species overwinters as a pupa, that when not overwintering the pupal stage lasted 16 days in one reared individual. ABBOT, of course, never published any of this but contented himself with the rearings he did so exceptionally well, with his exquisite illustrations and with penning copious notes which accompanied many of the paintings he sold.

Some of this information, taken from these manuscript notes, was published by BOISDUVAL and LECONTE (1833: 87, 89). SCUDDER, too, had access to ABBOT's MS observations and he has added much more to the brief amount given by the early authors (Scudder 1889: 1825-1826).

TIETZ ([1952]: 13) has given a surprising list of host plants, which I quote verbatim: "*Astragalus* sp.; *Crataegus* sp. (thorn seed pods); *Humulus Lupulus* Linn. (hops); *Hypericum* sp.; *Quercus* sp. (oaks); *Tilia glabra* Vent.; *Vicia sativa* Linn." There is no documentation of any of these, no clue as to their source, and I hold all but the quite probable *Quercus* to be suspect until supported by confirming observation.

Recently, while attending a staff picnic at Carnegie Museum's Powdermill Nature Reserve, my wife, ODETTE, brought me a lycænid larva she had found near the ground in the woods. By its size alone it was immediately recognisable as something out of the ordinary, most probably a Hairstreak although the usual Hairstreaks of the area should not have been larvæ at that time (8 July). I tried to induce it to feed by placing it successively on leaves of several available trees, including oak, but it showed not the slightest interest in any of them and, when left to itself, crawled down to the ground and came to rest on a dead leaf. This leaf and a few others, together with a bit of earth, were put into a paper cup and brought home.

For two days the larva remained thus, contracted and unmoving, and on 11 July it pupated. Two weeks later to the day, on 25 July, a hand-

¹ Contribution no. 3, Powdermill Nature Reserve of Carnegie Museum.

some male *Panthiades m-album* emerged. Eclosion was accomplished sometime in the morning but the exact hour was not noted.

GENERAL OBSERVATIONS

Larva. No description of the larva was made at the time so these few words are solely from memory. The specimen when found was dull olive green, perhaps more brown than green, and as pupation approached it became browner still. The diagonal dorsolateral segment lines common to many lycænid larvæ were well marked. In shape, apart from the rather large size, it was typically lycænid.

Pupa. ABBOT's drawings as copied (poorly) in Boisduval and Leconte (*op. cit.*, plates 26, 27) both show the pupa attached to a twig. The present specimen, however, pupated on a dead leaf originally on the ground and this may be typical. It was attached to the leaf by a girdle composed of a few strands of silk irremovably caught in a dorsal crease.

The pupa was brown, nearly unmarked save for a darker brown blotch middorsally on each of segments 1, 4, 5 of the abdomen. It measured approximately 11 mm. in length, distinctly pear-shaped with the abdomen considerably broader and higher than the thoracic and cephalic regions. A striking feature is the large dorsal separation between abdominal segments 5 and 6, marked by a polished black band, radially ribbed (under magnification) and inclined at a steep angle to the surface of the abdomen as a sort of "riser" to the step-down from the one segment to the next. It seems reasonable to suppose that this indicates mobility of the posterior abdominal segments and it may be related to the sound production described next. The pupal duration of 14 days corresponds well with the 16 days observed by ABBOT.

Most surprising of all is that the pupa is capable of making a very definite sound, consisting of a series of faint but distinct and rather high-pitched "chirps" — which it would make whenever it was disturbed. I know of no published reference to sound production in butterfly pupæ in North America but the Palearctic lycænid, *Callophrys rubi*, has been recorded (Ford 1945: 92) as making a sound described as a "slight creaking." F. M. BROWN (personal communication) informs me that he has noted creaking or chirping in three very different North American species: *Hypaurotis crysalus*, *Chrysophanus titus*, and *Strymon melinus*.

The five species now known to make sounds belong each to a different genus and represent a pretty diverse sampling of Hairstreaks, enough so that we are justified in suspecting that it may be a phenomenon common to all of them. Why, then, should it have remained so nearly unknown? With the host of keen observers in Europe and in North America one would have expected many references to it in the literature. I can only

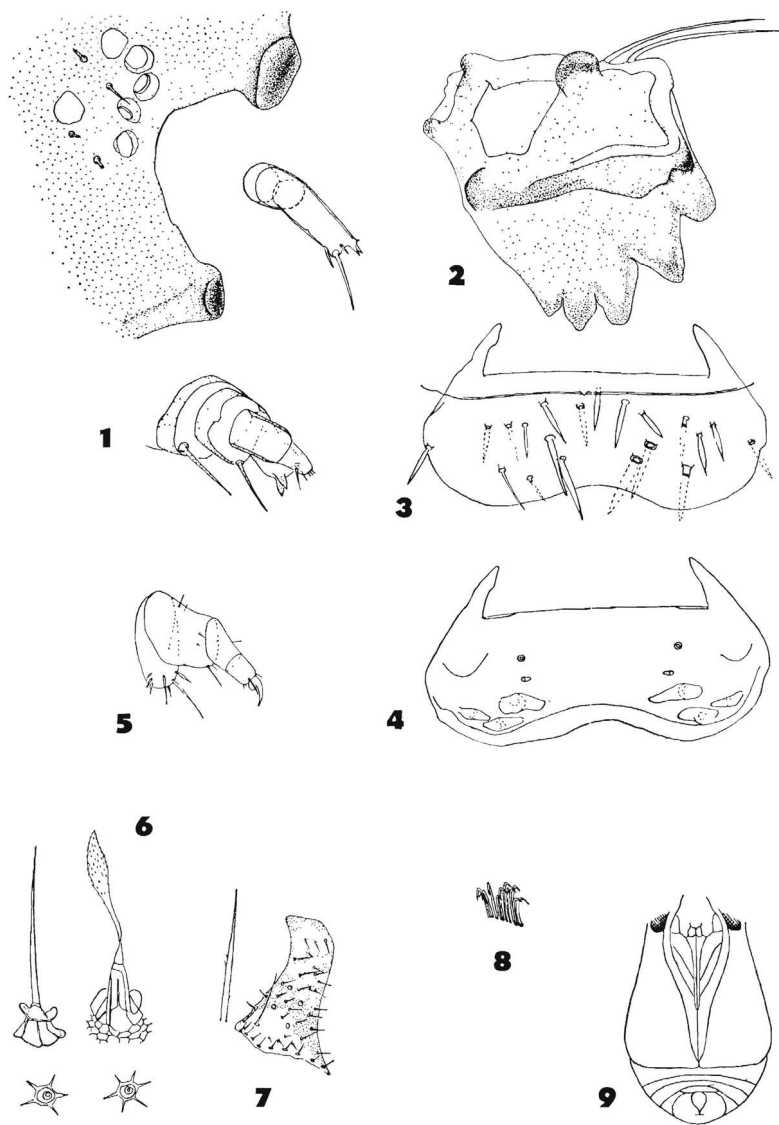
conclude that the sound, because of its faintness, has been overlooked. It is certainly to be hoped that those rearing lycænids, especially Hairstreaks, will make a point of determining whether or not sound is produced. In this connection it may help to add that I was able to elicit the sound at will by picking up the leaf with chrysalis attached and rotating it back and forth in one direction or another, though not violently of course. The sound was produced promptly and for some little time without further disturbance of the chrysalis although it must be placed close to the ear to be heard.

Note. After this paper had been submitted an important article (Hinton, 1948) on pupal sound production was found. HINTON lists (table II) a number of Lycænidæ which have been heard to stridulate as pupæ, among them the palearctic *Thecla quercus* and *Euristrymon pruni*. He also lists a Blue (the Indian *Jamides celeno*) and a Liphyrid (the East Indian *Allotinus horsfieldi*). "In the Lycænidæ," HINTON observes (*l.c.*: p.255), "both parts of the organ, which is between segments five and six, consist of rows of tubercles." This, as the description above shows, is not true of *m-album*, which has a well developed ribbed band on the posterior edge of segment five and no visible opposing tubercles. Other references to pupal sound production are in Hinton (*op. cit.*) and in Frings & Frings (1960).

LARVAL MORPHOLOGY

The chitinous structures of lycænid larvæ hitherto have received but scant attention, an omission which surely is responsible in great part for the present poor state of our knowledge of these larvæ. The advantages, however, of studying them are many and include such points as: (1) they are subject to very little distortion on mounting; (2) they normally present only limited individual variability; (3) they may be studied from cast skins as well as, if not better than, from whole specimens, thus enabling one to study and preserve larval structures and at the same time obtain the adult for firm identification.

With only *m-album* at hand there is no basis for comparison and hence no way of knowing to what extent the various structures may prove systematically useful. In consequence choice of structures for illustration has been governed partly by ready availability and favorable orientation for study, partly by unusual appearance (such as the star-socketed setæ), and partly by demonstrated usefulness in other groups (such as the ocelli, the labrum). The excellent survey by DETHIER (1941) of larval antennæ leads us to expect little if any useful variation in that structure, but until it has been compared more widely in the lycænids we may not yet reject it.



Panthiades m-album, larval structures: fig.1. — lateral view of anterior right side of head capsule, showing mandibular condyles and ocelli (also shown are right antenna, between condyles, and right maxilla, below); fig.2 — mandible (ental view); fig.3 — dorsal aspect of labrum (missing setae or parts of setae indicated by dotted lines); fig.4 — ventral aspect of labrum; fig.5 — left prothoracic leg; fig.6 — the two types of star-socketed setae: lateral aspect of the sockets and setae above, dorsal aspects of the sockets below; fig.7 — right half of prothoracic shield, with distal portion of a typical seta enlarged to the left; fig.8 — partial set of crochets from an abdominal proleg to show their irregular multiserial nature; fig.9 — ventral aspect of pupa, cephalic portion incomplete (drawn from vacated shell).

Five major types of cuticular structures, presumably sensillæ, were observed on the body segments. On the prothoracic shield (fig.7) two of them occur: (1) numerous sparsely trichose setæ, observed nowhere else; and (2) a few simple small circles, each surmounted by a small, globular, transparent "bubble", found widely elsewhere on the body as well. The next cuticular structure (3) is a simple, ordinary seta with a regular, conventional socket; these are numerous over the neck region and ventrally along the body on either side of the legs and prolegs. The last two structures (4) and (5) collectively may be termed "star-socketed" setæ (fig.6), since their primary joint characteristic is an elongated projecting socket with longitudinal buttress-like lamellæ regularly arranged around it, giving the appearance of star-like rays when viewed from above. They replace the "normal" setæ over most of the body, varying a little in the heaviness of the socket from one part of the body to another. PETERSON (1948: 157, fig. L 23 G) has illustrated what seem to be these structures (sockets only) from "an unknown . . . lycænid . . . from foliage of woodland trees." His magnification, however, was insufficient to reveal their nature. Perhaps most interesting of all is that these star-socketed setæ are found in two distinct types: (4) a five-rayed socket bearing a normal-looking (regularly tapering, slender, unarmed) seta; and (5) a six-rayed socket bearing a shorter seta with a clubbed and spiculate tip. The latter is the scarcer but still numerous.

The remaining structures illustrated are most or less self-explanatory and require no special comment.

Panthiades m-album IN PENNSYLVANIA

It is relevant to add here a few notes concerning the occurrence of this Hairstreak in Pennsylvania, for this state lies athwart the extreme northern frontier of the species range and such points as habits, broods, ecology and frequency have special significance for the species as a whole, as well as for problems of an even more general nature.

The following list gives all the Pennsylvania records of the species of which I have knowledge. I am indebted to Mr. GEORGE EHLE, Lancaster, Penna., for the records from Berks and Lancaster counties.

Allegheny Co.: Summer Hill, Pittsburgh, 1 ♂, viii. 1948 (A. MACHERZ; CM); Wildwood Hollow, Pittsburgh, 1 ♀, 13. vii. 1894 (B. KRAUTWURM; CM); Panther Hollow, Pittsburgh (W. J. HOLLAND; listed in Engel (1908: 34), but the specimen apparently lost); Gibsonia, 1 ♂, 4. viii. 1955 (J. GROM; CM); Glenshaw, 1 ♀, 7. v. 1959 (ETHAN COWLES; his coll.); Penn. Twp. (MARLOFF; in Tietz ([1952]: 13).

Beaver Co.: NE. corner of county, 2 mi. W. of Zelienople, 1 ♂, 3. viii. 1955 (CLENCH & N. D. RICHMOND; CM), dead on muddy bank of stream.

Lawrence Co.: Slippery Rock Creek, ca. 3 mi. W. of Porterville, 1 fresh ♀, 18. vii. 1953, and another fresh ♀, 6. vii. 1959 (J. BAUER, CM).

Westmoreland Co. (all Powdermill Nature Reserve, ca. 9 mi. S. of Ligonier, all but the last in the beech-birch-tulip-maple forest of the "Lodge area", all in CM): 1 fresh ♀, 14. v. 1948 (A. C. LLOYD); 1 ♀, 3. vi. 1958 (LLOYD); 1 slightly worn ♂, 4. vi. 1958 (CLENCH); 1 ♀, 7. vi. 1958 (BAUER & LLOYD); 1 rather worn ♀, 16. v. 1960 (LLOYD); 1 ♂, wooded part of "Cabins area" nr. Avinoff Lodge, *ex larva*, emerged 25. vii. 1960 (O. CLENCH), discussed in the first part of this article.

Berks Co.: Reading, 6. v. 1939 (PETERS); 9. v. 1943 (MAYER): both *teste* G. EHLE.

Lancaster Co.: Adamstown, 2. vii. 1939 and 28. viii. 1938 (both PETERS; *teste* G. EHLE).

Pennsylvania (no further data): Scudder (*l. c.*) and others. TIETZ ([1952]: 13) records it from "Rockville (April)" but there is no indication as to which of two towns of this name it might be: one in Dauphin Co., the other in Chester Co.

Flight periods. The few available records make determination of these periods both difficult and subject to uncertainty.

It is convenient to divide the records into three areas: (1) Allegheny, Beaver and Lawrence counties; (2) Westmoreland Co. (Powdermill); and (3) Berks and Lancaster counties. The first two of these groups may be studied together. In each of them there are two distinct flights and by assuming them to be of about the same length and that those at Powdermill are about a week delayed relative to those of the first area we obtain a duration of each flight of about one month, average flights dated in each area as follows:

1. Allegheny, Beaver, Lawrence counties: (5.v – 5.vi) (4.vii – 4.viii).

2. Powdermill (Westmoreland Co.): (12.v – 12.vi) (11.vii – 11.viii).

It may be significant that the first date of the spring flight in each area corresponds closely to the average date of the last killing frost.

Records from Berks and Lancaster counties are much fewer than those for the preceding two areas and pose some other difficulties as well. The two May records fit well with the area 1 spring flight but the single record each in July and August go with the second flight of neither area, the first being too early, the second much too late. I suspect that the species in this area may have three flights, instead of two. If we take the starting date of the first flight to coincide with that of the average date of the last killing frost in spring (about 26 April), and if

we assume that the duration of each flight and the interval between are the same as in western Pennsylvania, we would get the following:

3. Berks & Lancaster Cos.: (26.iv—26.v) (26.vi—26.vii) (26.viii—26.ix). These hypothetical flight periods do contain all four dates as well as the April date of TIETZ' record, which is from the same area.

Habits and occurrence. At Powdermill and some, if not all, of the other western Pennsylvania localities *P. m-album* is preeminently a forest species, though frequenting small clearings in these forested areas. There is possibly also an association with running water for most of them have been taken within a few feet of a stream.

The species is here definitely a rarity, as the short list of records shows. At Powdermill, following the first capture by LLOYD, a concerted effort to secure additional specimens was made, by LLOYD, BAUER and CLENCH, not only during the remaining time of the 1958 spring flight period but also during the summer flight period of that year, and both periods in 1959 and 1960. The result was an additional three specimens of the 1958 spring flight, none of that year's summer flight, none in either flight of 1959 and only a single specimen, of the spring flight, in 1960, this last a surprize, for it was taken several hundred yards away from the stream-side clearing where all the other captures had been made. It is of interest, too, that no one has yet seen an *m-album* imago anywhere near the spot where the larva was found, though most of us have spent a great deal of time there, at all seasons. It would seem possible that this species may be a dweller in the upper forest canopy, which would account for some of its rarity in the eyes of earth-bound collectors.

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