PSYCHE.

ON CERTAIN PIERIS CATERPILLARS.

BY WM. T. M. FORBES, WORCESTER, MASS.

Last spring while Instructor of Biology at Robert College, Constantinople, Turkey, the opportunity came to me to breed the caterpillars of Pieris daplidice, rapae and brassicae, side by side, and make comparison of them in all stages. During this time however I was away for more than a week, and was considerably interrupted by my regular work, with the result that there are several gaps in the descriptions.

I have come across no descriptions of P. rapae or brassicae, which take note of the tubercle arrangement. There is a quite full description of all the stages of daplidice in "The Entomologist" XXXIX, 193 (1906) by F. W. Frohawk, but this contains a few details not emphasized there, which may be useful in comparison with the other two. Judging by this description P. daplidice will have in stage II the tubercle arrangement of brassicae, rather than of rapae. It differs already of course rather widely in marking, showing the yellow subdorsal band.

The three species studied are of special interest as representing the three subgenera of Pieris. All three groups are represented in the Eastern States. *Pieris* (rapae) by rapae and the very rare oleracea; *Pontia* (daplidice) by protodice; and *Mancipium* (brassicae) by monuste, in the Southeast.

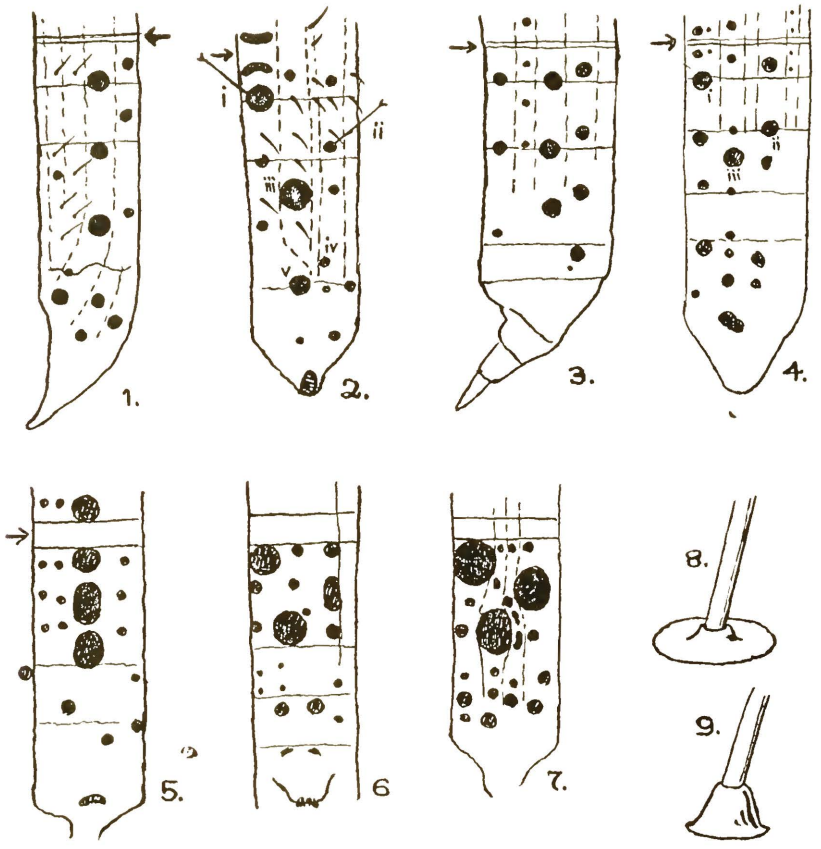
Two other species were captured in Constantinople, but males only; *Pontia chloridice* and *Pieris* (typical) *napi*.

I am especially indebted to Mr. J. W. H. Harrison for suggestions, and for the method of getting eggs.

An assortment of Cruciferous plants, most of them in flower, were placed in a bottle of water, with the space around their stems filled up with paper. Then a large bell jar was inverted over the whole, without any ventilation, the females were introduced and the whole set in the sun. The air inside became very damp, so much so that one female got stuck to the glass by her wings and had to be released. But

they laid freely and seemed to keep healthy. The jar was kept over till the eggs hatched, and then was removed.

The young daplidice caterpillars seemed to prefer the nearly ripe capsules of Cardamine, which fly apart suddenly when mature. Many of them were carried off



on the lids of these capsules before I discovered it. P. rapae in the first stage rested persistently on the yellow half dead lower leaves which they matched perfectly. They seemed to feed on them also, at least they did not turn green as soon as those resting and feeding on green leaves.

The figures are mere sketches, taken from living caterpillars in part, and should not be entirely trusted. But they will probably come nearer the truth than a much better description would.

Pontia daplidice. (Pontia.)

About April 4 a female of the form with light markings and sage green under side was confined over Cardamine and other Cruciferae.

April 9. It has laid several bright orange eggs, of which a specimen was preserved in glycerine jelly (not satisfactory). (The fresh laid eggs are lemon yellow, changing later to orange).

April 13. About 2 eggs have been laid, of which 3 or 4 have hatched.

Stage I. Bright orange, but not as bright as eggs, brown powdered, with black head and setae and deep brown tubercles. The tubercles are black except under very strong illumination, but then the setae and head are visibly darker. Length 1.6 mm. The upper setae are glandular and shortly forked at the tip, the fork containing a drop of secretion. There is a lappet hanging down in front of the first legs. Setae in primitive arrangement (iv and v on a level). Five yellow eyes.

Cervical shield with three setae in a triangle, on each side; divided. Below it a tubercle with two setae, one of which is glandular. One before and two below the spiracle. The glandular tubercles are the two upper on thorax and the three upper on abdomen. On the abdomen i higher than ii, iv slightly higher than v on the leg bearing segments, level with v on the others. On ninth segment of abdomen iv is absent. Supra anal plate has four pair and anal leg plates each four setae. There are 3 setae below on the last segment (A10).

Diameter of head .39 mm.

Stage II. Missed.

Stage III. Moult April 22; but one larva remains. Head .8 mm., gray, so powdered with black as to appear dull green. The powdering is of two sizes, about 5 pair of dots on each segment in a zigzag row being visible to the naked eye. Yellow subdorsal and substigmatal lines are caused mostly by a lack of powdering. The dark bands twice as wide as the yellow ones. Head black, heavily spotted on a yellow background. Apparently two of the subdorsal hairs (i and ii ?), still are glandular. All the hairs are similar, strong and black. Some without tubercles are not shown on the diagrams.

Stage IV. Moulted April 25 after one day of rest. Head black powdered on

yellow. Primary hairs are now no longer glandular and tubercles are shaped as in brassicae. The subdorsal and stigmatal yellow bands are clearly caused by opaque pigment. The addorsal and lateral gray areas seem to have a transparent dark pigment. There is a faint pale dorsal line. The venter is without skin pigment and is therefore pale green.

The tubercles seem smaller in proportion. Tubercle iii is much smaller than in P. brassicae.

The specimen died in moult and females of the summer brood refused to lay eggs.

Pontia brassicae (Mancipium).

About April 4 two females were set over mixed Cruciferae.

April 13 they were examined and three clusters of eggs were found, numbering about 40, 100 and 28. Both females had died.

Eggs laid in clusters on the under side of a leaf or on the stem near a leaf. Pale yellow and superficially like P. daplidice.

A hatched specimen mounted dry was much more satisfactory than one in glycerine jelly. They do not change color.

First Stage. Each cluster of the eggs hatched entirely on one day, April 18, 19, 20. They eat the eggs except the base and live gregariously, unlike daplidice. They *completely lack* the glandular hairs. The tubercles are twice as high and two thirds the diameter of those of daplidice. But the arrangement is essentially the same.

Stage II. The first cluster was up for moult April 22, moulted April 23. They are still gregarious and to the naked eye unchanged except as to size of head. Pale greenish yellow with black dots and tubercles; paler beneath. The subdorsal tubercles are alternately 2 and 1. The stigmatal ones are small and all beneath them inconspicuous (unlike daplidice).

Dorsal line yellow, subdorsally pale green, much black dotted by the tubercles. Laterally paler, with minute tubercles. The subventral dots are again larger, and the venter is very green, immaculate.

Stage III. First larvae up for moult April 24, moulted April 25. Head black (it is spotted in this stage of daplidice). Body yellow-green, black-powdered, with a narrow yellow dorsal line (wanting in daplidice) the powdering becoming abruptly less at the substigmatal line. Tubercles are acute and some are large. The setae now are white.

Stage IV. Tubercle iii is now twice as large as ii or i and the latter are four times as large as one directly above ii, which begins to be prominent. The tubercles

seem to make squarish black lateral spots on each segment. On the thorax there is an exceedingly large tubercle laterally (iii ?). The head is still black.

Stage V. There is little change in the body. The head is now pale, spotted with black.

Pontia rapae. (Pieris:)

April 20. Two females were set over Cruciferae for eggs.

May 3. There are a dozen or so eggs and five baby larvae.

Eggs differ from those of brassicae in being smaller, and being laid singly. Unlike those of daplidice they remain straw-yellow without any change of color till hatching.[1]

The larvae at first are a pale deadleaf yellow, including their head and tubercles. They sometimes rest on withered leaves and are almost impossible to see.

In this stage the tubercles are conical as in brassicae, but they are proportionately much sm: ller, and the upper ones are glandular.

Stage II. The tubercles all look much alike and are pale with black setae. The primaries are l.igher, larger and paler, and the upper ones have glandular setae. The setae are a little irregularly in about five transverse rows, the three major rows which show so prominently in P. daplidice not being distinct.

Stage III. The first larva changed May 7. Tubercles i to v are now all quite distinct and *white*, the others are more numerous than in stage II and not contrasting in color. The larva now appears green and velvety to the naked eye, like the full grown ones.

Stage IV. Tubercle iv is no longer white and contrasting, but i, ii, iii and v are still prominent, more so than before. There is a continuous yellow dorsal line and a very much broken substigmatal line. The hair is dark; that of i, ii and iii still glandular.

Stage V is the full grown larva and no description was taken. The white primary tubercles still show.

[1] American specimens bred this spring change color, but not so strikingly as P. daplidice.

TABULAR VIEW OF THE THREE SUBGENERA OF PIERIS.

PONTIA daplidice	PIERIS rapae	MANCIPIUM brassicae
Egg laid singly, yellow, changing to orange.	Laid singly, not changing color.	Laid in clusters of 30 to 100, not changing color.
Stage I. With very large black tubercles; low, round, and flat at the edges. Head black. With forked glandular hairs. Larva looks dull gray-green. (Skin orange till fed.) Solitary.	Smaller white tubercles. Head pale. With glandular hairs. Larva looks pale yellow. Solitary.	Moderate, high-conical black tubercles. Head black. No glandular hairs. Larva looks dark gray, becoming greenish. Social.
Stage II. Missed. Tubercle arrangement of *brassicae* but with glandular hairs. Marks as in stage III.[1]	As before the tubercles are paler, smaller; the primaries not very contrasting; i-iii forked, glandular.	As before the tubercles are black, the primaries much enlarged. No glandular hairs.
Stage III. Broad yellow subdorsal and stigmatal bands. All tubercles comparatively small, black. Tubercles ii very small but with glandular hair.	Green, no distinct marks. Tubercles very small; primaries (including iv & v) white, secondaries green. Primaries equal.	A narrow yellow dorsal and broad stigmatal bands, relatively higher than in PONTIA. All tubercles very large, the secondaries also easily seen. Tubercle ii smaller than i but very conspicuous.
Stage IV. The conditions of the last stage exaggerated; the tubercles smaller, stripes brighter. A narrow yellow dorsal. The tubercle above ii is about as large as ii.	Conditions of last stage exaggerated; primaries white secondaries concolorous; yellow dorsal and stigmatal. Tubercles proportionately smaller than even in daplidice.	On the mid-segments laterally there is more black than green, due mostly to iii, which is very large. i and ii are still as large as the tubercle above ii.
Stage V. As before. (Not seen).	As before. (Head green after first stage.)	Very little change, head is now spotted as in Pontia.

[1] From Frohawk, '06.

Explanation of Figures.

1 to 7. These are sketches showing roughly the position and size of the tubercles. No attempt was made to find all the minute setae not arising from tubercles, except in Fig. 2. They represent a single segment, as if it had been unrolled and spread out, in each case showing the part extending up from the leg, just beyond the mid-dorsum. An arrow indicates the middle line. The annulets are indicated in some of them.

Fig. 1. Metathorax of *Pieris daplidice*, stage III.

" 2. A middle abdominal segment of the same. The primary setae are numbered, and the glandular ones indicated.

Fig. 3. Metathorax of *Pieris daplidice*, stage IV.

" 4. Middle abdominal segment of the same. Tubercles iv and v are no longer distinct.

Fig. 5. Metathorax of *Pieris brassicae*, stage II.

" 6. Middle abdominal segment of the same.

" 7. Middle abdominal segment of *Pieris brassicae*, stage III.

" 8. A tubercle, with base of the seta, from stage I of *Pieris daplidice*.

" 9. A tubercle of *Pieris brassicae*. In P. rapae it is quite the same.

THE CHALCIDOID PARASITES OF THE COCCID *EULECANIUM NIGROFASCIATUM* (PERGANDE), WITH DESCRIPTIONS OF THREE NEW NORTH AMERICAN SPECIES OF THE SUBFAMILIES ENCYRTINAE AND APHELININAE FROM ILLINOIS.

BY A. A. GIRAULT, URBANA, ILLINOIS.

The Terrapin Scale, *Eulecanium nigrofasciatum* (Pergande), since its recorded discovery in 1898 by Theodore Pergande, has become gradually more and more known in economic entomology, so that at present it is recognized as a pest of some importance. Although it has heretofore been known to be attacked by parasites, none of these have as yet been specifically recorded in the literature and therefore I