

XXV. *Notes on the peculiar habits and changes which take place in the larva and pupa of Papilio Nireus.* By Mrs. M. E. BARBER. Communicated by CHARLES DARWIN, M.A., F.R.S., &c.

[Read 2nd November, 1874.]

*Papilio Nireus*, Linn. A large and handsome species. "Expands 3 in. 6 lin.—4 in. 3 lin. Rich velvety-black, with bluish-green stripes and spots." (R. Trimen, *Rhopalocera Africae Australis*.) This butterfly is common in most parts of the Cape colony. In its imago state the flowers of *Plumbago Capensis* are its favourite resort. It frequents orange trees, the larva feeding upon the leaves of that plant, and also upon those of an indigenous forest tree (*Vepris lanceolata*, Fl. cap. i. p. 447). In colour the caterpillar of *P. Nireus* closely resembles that of the leaves upon which it feeds, being of a dark green upon the orange tree, and of a lighter green upon the *V. lanceolata*. The pupa (of which I send you a drawing) may be found among the leafy twigs of its food-plant, or upon those of some neighbouring tree; its usual colour is green (Pl. IX. fig. 1). The drawing, however, goes to prove that, under peculiar circumstances, the caterpillar has the power of assimilating or altering its common colour, following suit, as it were, to any locality in which, by accident or otherwise, it may have been placed.

During the months of March and April I succeeded in rearing a number of these caterpillars. They were placed in a case with a glass cover; the case was partly made of wood, and partly of brick. The colour of the wood was a dullish-yellow, that of the brick a purplish-brown (figs. 3, 4). In the case I had previously placed a branch of the common bottle-brush shrub; its leaves had become partly dried, and were of a pale-green colour.

The caterpillars were fed upon orange leaves, and appeared to thrive well; they were fine, lively, well-conditioned specimens of their kind; they had fresh leaves supplied to them every morning, and, in fact, had nothing

to complain of. When they had attained the full size of their species, and had ceased to feed, they at once set out upon their rambles in search of a suitable spot wherein to assume their dormant or pupa state; finding, however, that their travels were circumscribed, they appeared somewhat puzzled what to be at, and after a fruitless search for a "leafy-dwelling," several of them returned to the orange leaves, and there suspending themselves upon the small twigs, took up their common form and colour (fig. 1); others went to the bottle-brush branch, and there became pale yellowish-green pupæ (fig. 6), of precisely the same colour as the half-dried leaves. One of the caterpillars in particular affixed itself upon the wooden framework of the case, where the wood and the brick came in contact with each other, and, to my surprise, this caterpillar, after throwing off its bright green skin, assumed the colours of *both the wood and the brick*, its under-side resembling that of the wood to which it was attached (fig. 3), and the upper side that of the adjacent brick-work (fig. 4). So perfect was the assimilation, that at first glance I failed to detect the pupa in its altered condition, and looked upon the floor of the case to see if the caterpillar had fallen. Some days later another specimen affixed itself to the wooden frame of the case, and then became a yellowish pupa (fig. 5), of the same colour as the wooden frame. I then tried an experiment by surrounding one of the caterpillars with a piece of scarlet cloth, but the creature failed to imitate this brilliant hue; the coloured spots upon the pupa were, however, of a brighter red than those upon pupa No. 1 (fig. 1), otherwise I could observe no difference. The season was now far advanced, there was no time for further experiments; I had succeeded in obtaining four different colours,—the dark green pupa of the orange tree, the pale yellow green of the bottle-brush, the yellow of the wooden frame, and the purple and yellow, when the colours came in contact. In its natural state I have ever found the pupa of *P. Nireus* to be true to the colour of the leaves of its food plant.

I do not consider the changes described in this paper to be merely accidental; it is sufficiently evident that they are of a conservative nature,—a protection to the butterfly, during its helplessness as a pupa, from the ravages of insectivorous creatures, to which a bright-green pupa upon a dark-brown surface would be greatly exposed.

The question, however, naturally arises, are the changes described produced by the desire or will of the caterpillar, like those which take place in the lizard of Griqualand, or in the chameleon, or is it merely an instance of nature's conservative power, brought about without any effort on the part of the creature itself?—a sun picture or photograph. You are aware of the exceedingly transparent nature of a pupa during the first day of its existence in that form,—may it not in that state have the property of absorbing or reflecting the surrounding colours, and thus become the means of its own concealment and preservation? That the caterpillar is aware of the change that will take place in its altered colour, I am fully convinced. I have no doubt whatever, that when the insect placed itself upon the dark-brown surface of the case, it was aware that the result would not be a bright-green pupa exposed upon a dark-brown surface to the vision of its enemies.

Moreover, I have several times observed that the larva of the Sphinx moth never differs in colour from that of the leaves upon which it feeds, excepting in its last change. To be, however, more explicit, the caterpillar of the Sphinx moth changes its skin many times while feeding, keeping true to the colour of the leaves of its food plant, until it has attained its full growth, and requires no further food. It then, *previous to casting its skin for the last time as a caterpillar, retires to a sheltered spot, mostly the brown stem of its food plant*, and throwing off its green coat, for which it has no further use, it assumes a dark-brown, earthen-coloured one. In this form it is destined to traverse the earth in search of its future habitation, in which as a pupa buried beneath dried leaves, or slightly beneath the soil, it has to pass the long winter months. If the caterpillar in its bright-green coat, exposed to its enemies, had to seek out its future hiding-place, how slight would be its chances of escape; its earthen colour is, therefore, of the greatest service to it, as was that of the green while feeding amongst the green leaves,—hence the cause of the wonderful changes which take place in the colour and form of these insects.