

NOTES ON NEOTROPICAL LEPIDOPTERA.

1. THE EARLY STAGES AND COMPARATIVE MORPHOLOGY OF TWO SPECIES OF *DYOPS* (NOCTUIDÆ) HITHERTO CONFUSED

by E. P. WILTSHIRE

Perhaps the most peculiar trees of the Neotropical forests, though not the most beautiful or majestic, are those of the genus *Cecropia*, known in Brazil as Imbauba; in English it is sometimes referred to as the Chandelier-tree, from its aspect, or the Ant-tree, from its myrmecophily.

During an all-too-brief stay of 18 months at Rio de Janeiro (see my general paper — *Journ. lepid. soc.* 13: 79-88; 1959), I decided to pay especial attention to the Lepidoptera and other insects attached to this genus of tree, and in a later article I hope to deal with the relations between various orders of insects on it. In this, my first special article on the Lepidoptera of the New World I shall deal only with two species of noctuid moth which I obtained in the forests fringing Rio only by breeding larvæ found on *Cecropia*. I suppose them to be monophagous on this genus, but of course cannot be sure.

The appearance of both these species of larva is of some taxonomic interest, as it differs from that hitherto considered to characterise the Quadrifid subfamilies of the Noctuidæ. These subfamilies are primarily classified by their hindwing neuration, but it is considered that they are also characterised by the less complete development of the larval abdominal legs. The Trifid group, of course, have five completely developed pairs, of roughly equal size. Many Catocalinæ (a subfamily of the Quadrifids) have five pairs, but the foremost pair, on abdominal segment 3, is smaller than that on segment 4. It now appears that the Dyopsinæ are an exception among the Quadrifids, as the pair on segment 3 is equal to that on segment 4, to judge from these two species. Both kinds of larva, moreover, have long single hairs of a sort never seen in the Old World on larvæ of Quadrifids.

Both I and Dr. H. B. D. KETTLEWELL, who was visiting Brazil when I found the first of the two (species no.2615), fully expected the larva to hatch into an Acronyctine or perhaps Arctiid moth; we were fooled by the long conspicuous single hairs, and the fully developed prolegs. We did not at first perceive that it lacked the rather dense tufts of hair of the genus *Apatele*, etc.; it reminded us of the Palearctic *Apatele alni*. A detailed description is given later of this larva, which is solitary.

When the moth emerged and proved to be a *Dyops* (there was little difficulty about determining the genus) it was a great surprise. Further examples were bred later in my stay, but the assistance of the British Museum was required to determine the species correctly.

As for the second species (no.2742), I only found the larvæ on one occasion, but as it was gregarious I was able to obtain more adults of it than of the first. This larva too, in its last instar, recalled an *Apatele* larva, but its earlier instars were so completely different from those of the first species, that it was again a great surprise when another *Dyops* hatched out.

On studying the material of this genus in the British Museum I found both forms confused in a series over the name *Dyops ocellata* Cramer; but the type of *Dyops cuprescens* Hampson, placed later, was in fact indistinguishable from the first, larger, species (no.2615). I found only slight differences in the male genitalia, and none in the female; it requires an experienced eye to distinguish the imagines by their pattern and superficial appearance, and without the clue given by the strikingly different larvæ the confusion in the Museum series might not have been rectified for many years. I must acknowledge the assistance of Mr. D. S. FLETCHER, without whom I would not now be able to give my conclusions on the correct names of these two species, with comparative morphology.

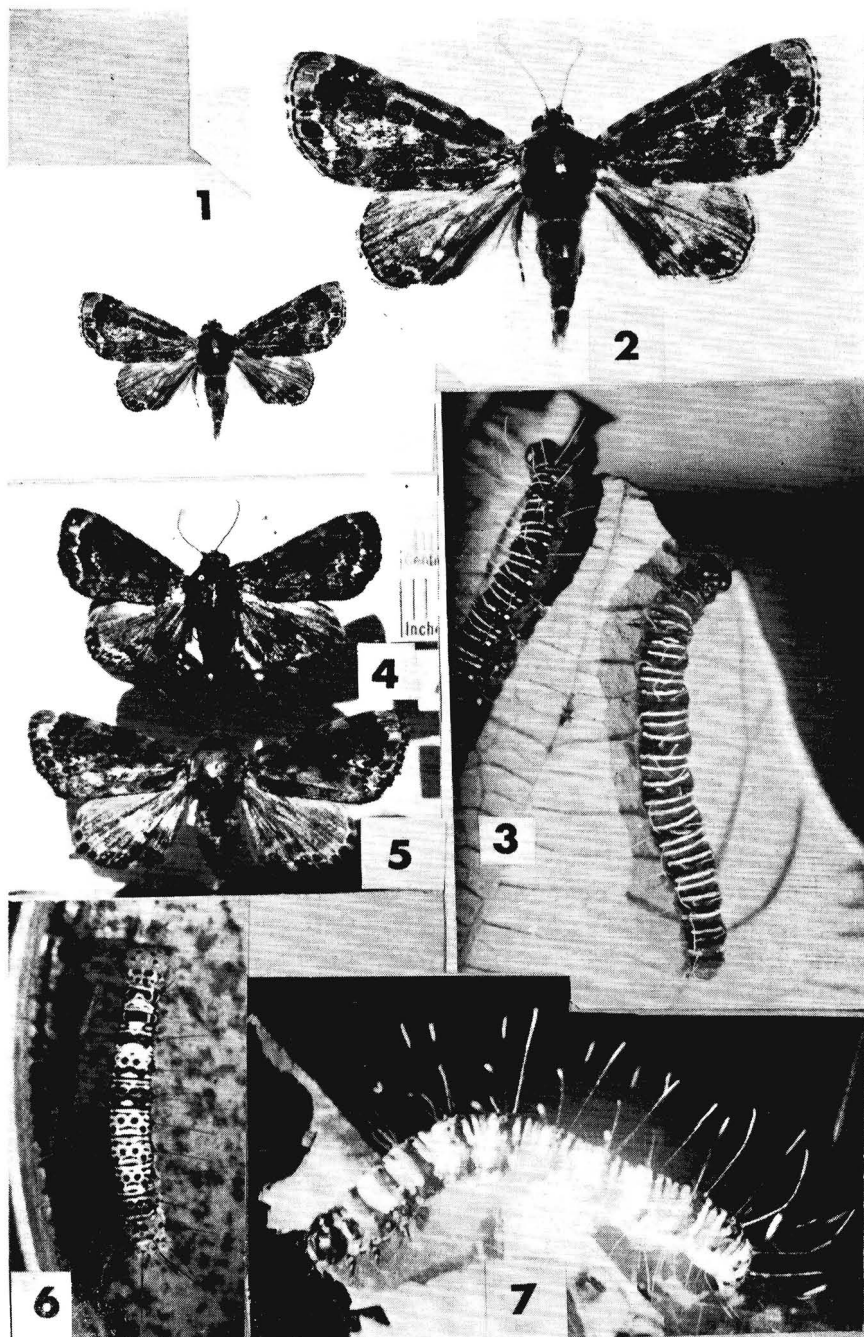
The two species, by priority of description, will come in the opposite order to that given above.

1. *Dyops ocellata* Cramer (no.2742) —

(1) *Dyops ocellata* Cramer [*Phalæna ocellata* Cramer (*Papillons exotiques* 3: pl.276, D, E; 1780)]. Dr. A. DIAKONOFF kindly informed me that CRAMER's type could not be found at Leiden. I select CRAMER's figure E as the LECTOTYPE, as I consider the two moths figured as not conspecific. CRAMER thought them the female (D) and the male (E) of the same species, but in fact the sexes do not differ in aspect or size in this genus, in my experience.

I also suggest that the British Museum's series from French Guiana should be neotypes (Plate 1: figs. 1 and 2).

Synonym: *Bœcula chromatophila* Walker, *List lepid. ins. British mus.* 15: 1669; 1858) for which I select as LECTOTYPE a ♀ in Hope Dept. of Entomology, University Museum, Oxford, "BRAZ. 276" (the type series of *chromatophila* is a mixture, but this selection disposes of the name).



1) — *Dyops ocellata* (French Guiana), NEOTYPE in British Museum ($\times 1$); 2) — same ($\times 2$); 3) — same, full-grown larvæ (enlarged); 4) — *Dyops cuprescens*, Rio de Janeiro, Brazil, ($\times 1$); 5) — same, Asuncion, San Lorenzo, Paraguay, leg. H. PEARSON ($\times 1$); 6) — same, penultimate instar larva (enlarged); 7) — same, full-grown larva (enlarged).

GUENEE's remarks on this species are an additional factor leading me to select *ocellata* as above, and are worth reproducing (*Hist. des insectes*, Lep. 6: p.283): —

"1088 *Dyops ocellata* Cr. 27 DE.

"38 mm. Ailes supér. d'un gris verdâtre, avec les lignes médianes géménées, ondées et denticulées. Une grande tache foncée, subcarrée, saupoudrée, et entourée de clair dans la cellule et, au bord terminal entre les 2me et 3me inférieures, un petit oeil noire à pupille blanche, double. Partie de la ligne subterminale qui le précède, d'un vert doré. Quelques points blancs près de l'apex. Coudée marquée de blanc au milieu. Ailes infér., d'un gris noirâtre luisant, avec un double trait blanchâtre à l'angle anal et deux petites taches ocellées, dont l'extérieure bipupillée et surmontée de vert-doré, entre les 2me et 4me inférieures. Derrière toutes les ocellées on voit, à certains jours, une bandelette cuivrée. Dessous des quatre ailes d'un gris jaunâtre, avec les nervures plus claires, une forte tache cellulaire, une ligne médiane et une ombre postérieure noirâtres, très marquées. Dessous de l'abdomen, avec une bandelette noire. Femelle semblable.

"Brésil. coll. Lefebvre, Saunders et Gn. On l'a envoyé en abondance des environs de Pernambuco.

"Nota, Cramer la dit de Cayenne et ses figures D et E paraissent présenter quelques différences, mais elles sont si grossières qu'il ne faut pas s'y arrêter. Il sera bon de vérifier toutefois par la suite si l'espèce de la Guyane est complètement identique avec celle du Brésil, que je décris ici."

The "green grey" fore-wing colour, referred to by GUENEE for his Brazilian species, characterises the gregarious smaller species (2742) taken by me. The larger, solitary species (2615) has a purple-brown ground.

The British Museum has a good series of both from French Guiana and Brazil; and after making preparations of the genitalia of several of each, Mr. D. S. FLETCHER found that the male's valve-apex afforded a good character, and kindly sent me sketches of this. My own slides, made from my material, corresponded well to those sketches, and figures 8 and 9 were made from them; fig.10 was made from Mr. FLETCHER's sketch of a species I do not possess, which can also be distinguished by the valve apex. It will be seen that the valve terminates in a short membranous flap with short hairs: in *ocellata* (fig.8) this flap continues in a straight line from the costa to its point, from which its ventral border curves away at an acute angle to merge in the valve's chitinous ventral border; in *cuprescens* (fig. 9) the flap's point is roughly midway between costa and ventral border, forming a right angle and being obtusely angled to the costa; in *dotata* Walker (fig. 10) the costa and ventral borders taper to a very acute tip.



8) — *Dyops ocellata*, ♂ genitalia, ventral open view, with aedeagus detached; 9) — *D. cuprescens*, ♂ right valve tip; 10) — *D. dotata*, ♂ left valve tip. All drawings to same scale.

EARLY STAGES (2742).

On November 2, 1958 I found on a single low leaf of a *Cecropia* sapling on the side of the Rua Redentor, Corcovado Mountain, Rio, at about 500 m. height, a gregarious mass of nearly fifty larvæ nearly 1" long, slender and glossy brown, with black heads and scanty black hairs which were inconspicuous. The head and tail were slightly raised; all feet were black; there were five equal pairs of abdominal feet. The larvæ rested side by side touching each other, and usually fed in the same formation. They resembled a putrescent jelly-like mass and were repulsive, both in this and the next instar. On November 6 they moulted gregariously; after this they were orange-brown in colour, 22-25 mm. long.

On November 18 they again moulted gregariously; and immediately after, the larva-mass appeared darker, as though mouldy, this impression being given by the fresh white hairs on the new dark skins. A little later, they separated to feed and ceased to be gregarious.

Mature larva (fig.3 of Plate): black, with three fine white transverse dorsal lines on each somite and an orange-brown lateral stripe running the length of the body; head glossy black; feet black; ventral surface, with a few transverse short lines.

Foodplant: *Cecropia*, and occasionally if nothing else was offered, the foliage of two other trees.

Cocoon: silken, firm, with debris adhering to the outside; I am uncertain where it is placed in the wild state, but presume on the ground, perhaps below the surface.

The moths started emerging on November 27, and about forty had hatched by the end of the month. Many were under-sized due to the difficulty of providing enough of the right foodplant daily; no more moths emerged after December 30. Probably the phenology of this moth is like that of the following species, *i.e.* multivoltine with "winter pause", but as only one generation has been bred, this is a guess. In an equatorial climate the "winter pause" would, I suppose, not be made.

The adult moth, when disturbed, falls on its back and flutters jerkily vibrating its wings and body and revealing the lighter, more orange and banded under-side colouring; this is possibly a mimicry of Hymenoptera and may be in an early stage of evolution. It might, alternatively be an exhibition of deceptive or "flash" colouring before suddenly settling.

2. (no.2615) *Dyops cuprescens* Hampson 1926

This was named by HAMPSON in *Descriptions of new genera and new species of Noctuidae* 128. The ♀ of CRAMER's *ocellata* (Pl.276 D) appears identical with both sexes of this species. HAMPSON's type, from Chaquimayo, S. Peru, is in the British Museum.

This species is on the average larger than the preceding and can usually be distinguished from *ocellata* by its purple-brown fore-wing ground-colour. See also figure 9 for the valve-tip of the male, and remarks under *ocellata* above.

EARLY STAGES (2615).

I have found the half-grown and full-grown larvæ on the underside of larger leaves of young *Cecropia* trees, feeding by day but hidden. They are usually found singly, but when small are sometimes found two together.

Fourth (?) *instar*: about $\frac{3}{4}$ " long, resembling bird-excrement, brown, slender, shiny, with dorsal white patch on somites 4-9, and paler brown

ventrally. Head yellow brown. Setæ black, white-ringed, with rather long black hairs. A slightly larger larva, observed on another occasion was bluish white, suffused with yellow near the spiracles and on somite 11; the head was yellow with four black spots as big as the setæ (see Plate 1, fig.6).

Next instar. the head is glossy black, some of the hairs have thick tips, and the length of the larva is 1"-1½" (see fig.7). On the slightly enlarged 10th somite there are two dark patches above two lateral warts; these patches may be brown or black. The dorsal and ventral areas are white with heavy black setæ, recalling European *Cucullia* larvæ; between the two posterior setæ of each somite is a short black transverse bar; there are also other transverse black bars of varying length on each somite and these tend to become broader laterally; in the darkest forms these black markings coalesce so that the setæ no longer appear as distinct black spots, and the white colouring is reduced to the extent of forming two creamy transverse dorsal bands, and a pair of creamy lateral spots on each somite. One larva found full-grown was feeding on the underside of a large leaf with only its head shewing. When I picked the leaf it stopped, threw back its head in alarm and assumed a dead, squashed appearance, looking rather limp and mouldy. A small dipterous fly was noticed trapped in the hairs of this individual and appeared lifeless. A pre-pupal change of colouring affects the sublateral and ventral areas which turn deep crimson, leaving the dorsal area creamy white dappled with black.

Cocoon: silky, firm, with debris adhering; pupal period, about three weeks.

Phenology: multivoltine with a probable diapause in the cool season; apparently there are four broods during the warmer half of the year at Rio. Larvæ of the first are full-grown in early November and produce moths in early December. A full-grown larva was also found in early January and would have produced a moth in mid-February had circumstances permitted completion of rearing. Half-grown larvæ found in April produce moths in late April and early May. Half-grown larvæ found in mid-May produce moths in late June. Whether there is really a diapause in July-October, and in what stage, is uncertain.

Pupa: glossy dark brown, heavily chitined, of normal noctuid aspect, without bloom. The wings cover part of the first five abdominal somites, leaving the next five clear and entire cremaster, consisting of seven short, straight, sharp, well-separated spines, on a blunt, rounded rump.

3. Other *Dyopsinæ*

Although I have personally come across only the above two species, it may be of interest to add a few words here about other species in this sub-family which appears to be endemic Neo-tropical.

The whitish-banded form *Dyops dotata* Walker has been placed in the British Museum as an aberration in the *D. ocellata* series, but Mr. D. S. FLETCHER after investigating the male genitalia came to the conclusion that it was also distinct (see fig.10 for its valve tip.).

The remaining *Dyops* species in the British Museum are easily distinguished from the above three; their names are: *chlorargyra* Hampson, *cyanargyria* Hampson, *pupillata* Felder, *subdifferens* Schaus; and, placed in a separate genus (*Eudyops* Hampson), *xantholepis* Dyar.

Immediately following GUENEE's description of *ocellata* quoted above are the descriptions of two further *Dyops* species: 1089. *Dyops oculigera* Gd. (38 mm.) and 1090. *Dyops hatuey* Poey (58 mm.); of these two I have no knowledge and can express no opinion.

SUMMARY

Two species of *Dyops*, widespread in Central and South America and hitherto confused, have been studied and bred in Brazil.

Dyops ocellata is the smaller species; fore-wing greenish brown in ground-colour. The larva is gregarious at first and in its last instar is black with creamy white hoops and orange lateral stripes, and has long single hairs. A lectotype and a synonym of *ocellata* are given.

Dyops cuprescens is the larger species; fore-wing purplish brown in ground colour. The larva is solitary or found in couples at first; it is whitish with black spots and bands and long hairs thickened at the end.

Both larvæ have ten abdominal prolegs equally developed; this, together with the long hairs, distinguishes them from the larvæ of other sub-families with which this genus has been placed. The foodplant is *Cecropia*, a myrmecophilous tree.