ART. XXXI.—Epalxiphora axenana, *Meyr.*: *a Species of* Lepidoptera *scarce in New Zealand.*

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[*Read before the Wellington Philosophical Society, 1st June,* 1904.]

Plate XXI.

THIS species of *Lepidoptera* I found of considerable interest. It occurs throughout New Zealand from early summer to winter, but seems to be scarce everywhere, though its relative scarcity probably depends to some extent upon climatic conditions. During the summer of 1901–2 sunshine was continuous throughout, and *Epalxiphora axenana* occurred in considerable numbers in the strip of sparsely wooded bush reserve where I had previously taken the species but sparingly. I do not know where the males rest, but have beaten them from brown dry leaves of tree-ferns, and also from the green leaves of the food-plant. I do not remember to have ever seen a male resting in an exposed situation; the females, however, rest exposed on the upper side of a leaf of *Piper excelsum* (its food-plant), where the coloration is rather conspicuous, but the shape of the insect with its wings closed is not mothlike—*i.e.*, not conspicuously so. The position taken up by the females is not accidentally due to the drying of the wings on emergence from the pupa, which takes place during the afternoon. The insect flies at dusk, whereas my specimens have always been taken during the forenoon, and from two so taken I procured ova which were fertile, proving the insects had been flying the previous night.

Mr. Meyrick has twice published his diagnoses of the genus *Epalxiphora*.* His description of the species was made from a single ♂ specimen taken off a tree-trunk in Wellington, New Zealand. The sexual dimorphism of the species makes descriptions of the ♀ ♀ a necessity. The costa of anterior wings is in males curved, in females elbowed; the anterior-wing markings differ between the sexes: ♂ pattern is divided into basal and outer areas, with a characteristic buff apical tip; ♀ pattern is composed of transverse and longitudinal markings usually, but this sex is very variable. A bright-orange basal streak on costa of posterior wings ♂ (covered by anterior wings) is not present in ♀. The only mark of anterior wings which appears to be present in both sexes is a crescentic or angular mark about the middle of the inner margin, which, when the wings are closed together edge to edge over the back, forms a characteristic ocellated spot.

* Meyr., Proc. Linn. Soc. N.S.W., 1881, 648; Trans. N.Z. Inst., xvii., 147.

Epalxiphora axenana. Fig. 8.

25 mm. Forelegs dark-fuscous, ringed ochreous at joints; head above fuscous mixed with grey; thorax dark or light fuscous, tufts pitchy. Abdomen ochreous (anal segments testaceous) or wholly yellowish-grey. Anterior wings curved from base, apex falcate, outer margin obliquely sinuate. Basal area grey broadly mixed with dark fuscous dots to $\frac{1}{3}$ costa, whence edged with indefinite dark fuscous transverse line to middle of wing, then with inner tooth and outward curve to $\frac{1}{2}$ inner margin it includes the marginal lunar mark, which is completed by a faint curve and dot; towards the inner margin the basal area shades to brownish-grey. Outer area dark-fuscous towards costa, reddish-brown or delicate violet hue towards inner margin; an elongate transverse costal spot of either colour at $\frac{1}{2}$ runs into discal black line, sometimes dividing it into two angular spots, in front a yellow or buff tip obliquely elongates to apex. Cilia ochreous with dark fuscous bars and basal line. Posterior wings grey or lighter with dark posterior mottling, cilia white with very fine dark-grey basal line.

Six ♂ ♂, others not retained: except in ground-colour and presence or absence of the violet hue there is no variation.

Epalixiphora axenana, ♀. Fig. 1.

27–30 mm. Head and thorax usually of same colour as ground-colour of wings, tufts pitchy only when some of the wing-markings are so. Abdomen yellowish-white. Anterior wings: Costa elbowed at $\frac{1}{3}$, thence slightly curved to apex, outer margin obliquely sinuate, apex falcate. Ground-colour very pale-yellowish (bone-colour), at base mixed with dark dots, near inner margin suffused with greenish-fuscous. At $\frac{1}{3}$ costa a dark olive-green transverse elongate spot to discal cell, below is a paler spot, and an indefinite longitudinal line angulated or curved to inner margin. At $\frac{2}{3}$ costa a transverse greenish fuscous spot curved outward unites with a patch of similar colour covering the whole anal area, extending from before middle of wing longitudinally with irregular outline to near apex, its transverse outline deeply broken by the ground-colour forming the curve of lunar mark at $\frac{1}{2}$ inner margin. Nervures posteriorly thinly fuscous. A dilated sinuate costal streak of greenish-brown colour from $\frac{1}{3}$ costa to near apex breaks the ground-colour into a longitudinal pattern. Cilia pale reddish-grey barred with fuscous. Posterior wings: Apex more acute than ♂, margin somewhat sinuate. Light-grey with posterior yellow tint, dark longitudinal mottling, cilia whitish, basal line fuscous.

I have selected this as the type form, it being the most abundant, though there is considerable colour-variation, chiefly as follows:—

a. Anterior wings: Ground-colour pale-yellow with greenish hue, markings pale-green, inner marginal lunar mark surrounded with dark-fuscous. Not common.

β. Anterior wings: Ground-colour reddish-yellow, markings ferruginous, the whole therefore having a reddish hue. Not common.

γ. Anterior wings: Ground-colour as type but less distinct on lower area, markings dark-fuscous without greenish hue, anal patch coppery-brown. A very handsome form; not common.

The following I prefer to term "aberrations" rather than "varieties," since one needs to breed from ova a larger proportion of any given form to term it a definite variety, otherwise subspecies.

Ab. albo-suffusa, n. ab. Fig. 2.

Anterior wings: Markings longitudinally divided from inner base to apex, the line of division deeply dentate at $\frac{2}{3}$; ground-colour white above, at $\frac{1}{6}$ costa a dark greenish brown elongate transverse spot; a very faint costal mark at $\frac{1}{3}$, costal streak at $\frac{2}{3}$ to near apex is fuscous mixed with lighter; lower half similar to type of markings; colour fuscous posteriorly dusted with white, nervures thinly marked, marginal lunar mark distinct. Some specimens are suffused with white over a larger area restricting the anal patch, the dark costal mark at $\frac{1}{6}$ normal; inner margin has thin fuscous basal streak to lunar mark wider beyond and shading to grey at outer margin. Some have inner colour coppery.

Ab. brunnei-lineata, n. ab. Fig. 3.

Anterior wings: Dark fuscous streak extends from base to below apex, with a parallel line above it of reddish-yellow ground-colour heightening the linear effect, being suffused with fuscous on costa, with normal fuscous costal marks; below the colour is suffused with dark-fuscous from base to lunar mark and beyond. Posterior wings grey, with posterior reddish hue. One specimen

Ab. purpurascens, n. ab. Fig. 4.

Anterior wings: Pattern composed of two colours separated by an almost straight dividing-line from base to near apex; costal area is unicolorous, pale-yellow (bone-colour), costal marks faintly dusted in grey; lower area is purplish-red, marginal lunar mark scarcely perceptible. Cilia reddish-yellow. A specimen has pale fuscous costal marks, lower area of wing deep-purplish-black with some indistinct markings. Rare; three specimens.

Ab. **obsoleta**, n. ab. Fig. 5.

Anterior wings: Ground-colour pale-yellow with an orange suffusion at base, longitudinally and posteriorly; no other markings. One specimen.

Ab. **obscura**, n. ab. Fig. 6.

Anterior wings wholly covered with fine sheeny dark-fuscous dots obscuring all markings except faint costal marks at $\frac{1}{6}$ and $\frac{1}{3}$, and faint lunar mark; apex of anterior wings tipped pitchy; thoracic tufts pitchy. One specimen.

Ab. **nigra-extrema**, n. ab. Fig. 7.

Anterior wings black, costal area to $\frac{1}{3}$ light-fuscous with black dots, and spot at $\frac{1}{6}$; fuscous mottling at $\frac{2}{3}$ in middle of wing, similar mottling from lunar mark to anal angle. Several specimens, one having purplish-red ground-colour instead of black.

The female deposits a circular semitransparent mass numbering some twenty-nine ova, symmetrically imbricated, closely appressed. If laid on a green leaf, reflection of the natural tint of the leaf through the ova must afford greater protection than any colour of the egg-shell could do. Ova deposited 22nd January, 1902, hatched 5th February = 14 days. Ova deposited 20th February, 1903, hatched 5th March = 13 days.

Ovum (figs. 9, 10, 11): Each ovum is oval in outline, slightly convex above and covered with a rather large crystalline pattern composed mostly of pentagonal but some hexagonal figures. Examined some hours after they were deposited each ovum had inner and outer circumferences, the pale-greenish egg-contents not reaching the outer wall of the ovum; the micropyle, forming a rosette of small elongate figures, is situated towards one end of the ovum on this rather wide marginal area. The ovum is always so placed in relation to the egg-mass that the micropyle is outwards and not covered by other ova. The first ovum laid forms the centre of the egg-mass to the disadvantage of the ensuing larva, which may—as it did in one instance—fail to eat through the overlapping edges of surrounding ova.

For two days the ovum contained only yelk spherules and the protoplasmic fluid whence the embryo ultimately develops: no cellular activity was observed.

In seven days the embryo reached an advanced stage, having formed, though neither caput nor thoracic segments could be detected, and at the head area, towards the micropyle, a large quantity of outer (greenish) spherules remained; the ocelli of the caput were distinct, the thoracic legs exceedingly long, out-

line of the abdominal segments quite distinct, abdominal feet and claspers well developed, even the anal comb could be distinguished; the outer spherules about these parts were almost used up. The number of developing embryos within the egg-mass reminds one of a dish of opened oysters. Two days later internal anatomy was well formed, and all external tubercle setæ and the jaws of caput becoming chitmous.

On the eleventh day the caput was very distinct, assuming at first a faint violet hue which gradually darkened to brown, the jaws appearing bright-reddish; spherules immediately in front of caput were not quite used up. No movement of jaws, but internal pulsation was observed. The larva does not emerge through the micropylar area.

The newly hatched larva does not eat the egg-shell. Young larvæ feed on the under-surface of a leaf beneath a few threads of silk; later two leaves are drawn together, or, failing this, the leaf is folded over. *Piper excelsum* is the staple pabulum of *Epalx. axenana:* the leaves are broad and succulent. In normal seasons it is difficult to find leaves of *P. excelsum* which are not riddled with holes: one suspects these are made by slugs. The larvæ of *Epalx. axenana* are easily alarmed and drop to the ground; they are seldom found feeding between leaves which have holes in them: the slugs or whatever cause the holes are probably responsible for a high mortality among them by alarming them away from their food. During the genial season referred to very few leaves of *P. excelsum* had holes in them (it was a very dry season), and the larvæ were plentiful on that plant, and on several other plants and shrubs on which I never found them at any other time.

The larva (figs. 12, 13, 14) when newly hatched has a very dark-brown head, otherwise it is transparent pale-greenish. The head is flat-elongate, and the mouth parts protrude forwards; tapering somewhat anteriorly and posteriorly, abdominal segments 1 to 3 are widest, and the 9th narrowest. The whole skin is covered with long spicules; all setæ are smooth. Prothorax has no scutellum; on either side of medio-dorsal line are three setæ anterior marginal and three setæ posterior semimarginal, all equidistant. Posterior spiracle circular, prespiracular tubercle bears three setæ, tubercle above legs two setæ. Abdominal segments: Trapezoidals normal, i. seta short, ii. seta longer, supraspiracular single long seta, spiracle circular placed on a mid-lateral swelling, the subspiracular is anterior and higher than the post-subspiracular tubercle, single seta each, basal tubercle bears two setæ. Abdominal feet have a single row of dark widely spaced hooklets, about twelve in number.

The larva in its second stage is very pale-greenish colour,

head yellowish with a suspicion of mottling. The mouth-parts are normal, not protruding as in previous stage; spinneret is short and stout. Prothorax as previous stage. Mesothorax: One below the other are two setæ in a dorsal depression, below which a large swelling bears two similar setæ, a lower posterior swelling bears one seta, an anterior swelling bears two setæ; tubercle above legs bears two setæ. Abdominal segments: All tubercles bear single seta, i. and ii. normal, iii. above the spiracle, which is well sunk into a lateral depression, anterior subspiracular almost below spiracle, post-subspiracular quite beneath, vi. anterior, basal setæ three in number. Abdominal feet have a single row of closely placed terminal hooks.

The adult larva is semitransparent green, with no appreciable markings except on the head, which is yellowish with characteristic brown mottling on each lobe. External structure as in second stage.

The length of a larva at fifteen days is 10 mm., after which it grows rapidly; at thirty days it is 28 mm., remaining attenuated in breadth. Duration of larval existence, thirty to thirty-two days.

The skin has a reticulation. From the centre of each figure—hexagonal or what not—of which it is composed a small boss rises tipped with a spike: these spicules persist throughout the larval existence, and practically cover the whole skin; but around the base of setæ a space exists without the spicules. The anal comb is seen with difficulty in a newly hatched larva, when the prongs are like setæ. In an adult larva (figs. 15 and 16) the comb consists of eight strong prongs each terminating in two points; at either side are incipient prongs. The prongs rise from a small pad on the underside of anal flap. Judging from the direction of the prongs in different specimens examined, the comb may be elevated or lowered at will. The function of the comb is probably in connection with the removal of excrement, and the position of comb is best seen when the anal flap is distended at the passing of same. Spicules are numerous in the region of the comb.

I once found three pupæ each in a leaf of *Urtica ferox* (tree-nettle). These leaves are covered with stinging spines, and had been rolled into a cylinder. It is doubtful whether the larvæ fed on the *Urtica* leaves.

The pupal shroud is made by the larva first with an outer series of silk threads apparently placed irregularly, but designed to hold together the two leaves or the fold of the leaf and prevent any alteration in the curvature which might subsequently affect the pupa disadvantageously. Within this outer series of threads a definite closely woven elongate cocoon is made,

having a slender neck which extends to the edge of leaf or leaves. The pupa is suspended horizontally within the body of the cocoon. In emergence the pupa projects rather more than the thoracic segments beyond the neck of the cocoon, a silken cable secured to its anal armature preventing it from overpassing the point of security and falling to the ground. I did find one pupa, which had either slipped its cable or broken it, with its anal armature amongst the outer silk at the mouth of the cocoon; the pupa, having passed quite out of the cocoon, was empty when found.

The pupa at first is unicolorous, green with darker green mediodorsal line on abdomen. The first colour-change is noticed in the eyes, which become red, then a reddish colour spreads over the face-parts, next the thorax and wings show imaginal markings. Duration of pupal stage, seventeen to twenty-nine days.

The pupa is 9 mm. long, 3 mm. wide at mesothorax, anterior end rounded; the segments taper dorsally and ventrally from mesothorax; the 9th abdominal is ventrally rounded, 10th produced to a long blunt point carrying two lateral hooks on each side, two ventro-posterior hooks, two posterior hooks—in all eight hooks, which are not the modified prongs of the larval anal comb, but a distinct pupal armature. Wing-cases extend to the posterior edge of 3rd abdominal segment; antennæ follow the costal curve from back of eyes to tips of wings; proboscis and two pairs of legs fill the space to antennal tips. Abdominals 2 to 7 carry two rows of dorsal spines. Some portions of the segments have a reticulation similar to that on the larval skin, but without bosses or spikes except in the region of the obsolete anal orifice, where a minute point appears in the centre of many figures of the reticulation.

On dehiscence the head separates and carries the antennæ, which are separated throughout their length from the other organs; leg-cases remain attached at their tips; wing-cases are loosened at their suture with abdomen. The dorsum of thorax splits centrally.

The imagines of first brood were all males with one exception, a ♀ type like its parent. Imagines of second brood were mostly males, but there were two typical females, and one like the parent, type form *β*.

Parasites on *Epalx. axenana*: Frequently the one true home of the larva of *Epalx. axenana* is occupied by a spider; sometimes a living larva and a living but very small, possibly juvenile, spider have occupied the same roof-leaf, and pupæ have been similarly situated. Sometimes the pupa contains the grub of a parasite which assimilates the internal anatomy

of its host, and emerges from the head of the pupa-case a fly—an *Ichneumon, Triclistus*, Forst., sp. nov., of which Mr. Claude Morley says, "certainly very closely allied to *Trilistus nigritellus*, Holmyr., from which it differs mainly in its unicolorous antennæ, dark tegulæ, black hind tibiæ, and larger size."

EXPLANATION OF PLATE XXI.

Fig. 1. *Epalxiphora axenana*, ♀ type (nat. size).
Fig. 2. ,, ♀ *Albo-suffusa*, n. ab. (nat. size).
Fig. 3. ,, ♀ *Brunnei-lineata*, n. ab.
Fig. 4. ,, ♀ *Purpurascens*, n. ab.
Fig. 5. ,, ♀ *Obsoleta*, n. ab.
Fig. 6. ,, ♀ *Obscura*, n. ab.
Fig. 7. ,, ♀ *Nigra-extrema*, n. ab.
Fig. 8. ,, ♂ type.
Fig. 9. Ova, imbrication, and ovum at two days (×75).
Fig. 10. Ovum at seven days (×75).
Fig. 11. Micropyle, and sculpturing of ovum (×250).
Fig. 12. First larval stage, dorsa of posterior segments (×250).
Fig. 13. ,, dorsum of caput (×250).
Fig. 14. ,, 3rd abdominal segment, lateral view (×250).
Fig. 15. Second larval stage, anal comb, anal flap distended (×250).
Fig. 16. Ultimate stage, anal comb, ventral view (×50).

Art. XXXII.—*On the Occurrence of* Graucalus melanops, *Latham, in New Zealand.*

By Captain Hutton, F.R.S.

[*Read before the Philosophical Institute of Canterbury, 2nd November, 1904.*]

On the 11th June last the Museum received a specimen in the flesh of the shrike-thrush from Mr. E. A. Radford, of Gebbie's Valley, who stated that he had picked it up dead on Rabbit Island. The bird is in the young plumage, and proved to be a male.

The first recorded occurrence of the species in New Zealand was a specimen in the Nelson Athenæum, which had been shot in an apple-tree at Motueka in 1869 or 1870. Another specimen was shot near Invercargill on the 8th April, 1870. Both were in the immature plumage. I was also informed by the Hon. W. Mantell that he had seen one at Port Chalmers in 1842. Mr. W. T. L. Travers also told me that he had seen the bird at his run at Lake Guyon, and Captain Fraser told me that he had seen it at Lake Hawea. In all these instances the birds appear to have been in immature plumage also. This seems very remarkable.