

XXIX. *ALLUAUDELLA HIMALAYENSIS*,
A NEW SPECIES OF DEGENERATE (♂)
COCKROACH.

WITH AN ACCOUNT OF THE VENATION FOUND IN THE GENERA
Cardax AND *Alluaudella*.

By F. H. GRAVELY, M.Sc., Assistant Superintendent, Indian
Museum.

Introductory.

The genus *Cardax* was founded by Mr. Shelford in the year 1908 for the reception of a little *Embia*-like cockroach, male specimens of which were attracted to the lights in Mr. Green's bungalow at Peradeniya in Ceylon. They were forwarded to Mr. Shelford by Dr. Willey, and received the name *Cardax willeyi*. During the present year Mr. Shelford has described a similar male cockroach from the Kulumusi Caves near Tanga, in German East Africa. For this species he has founded a separate genus, the full name of the species being *Alluaudella cavernicola*. From his descriptions the generic distinctions appear to be: the smaller size of the eyes in the latter; the form of the pronotum, which covers the vertex of the head in the former but not in the latter; and differences in the venation.

During a recent visit of Dr. Annandale to Kurseong, in the Darjiling district of the Eastern Himalayas (4,700 ft.), a single male specimen of yet another species of *Embia*-like cockroach was found. Like *Cardax willeyi* it was attracted to the light of a house, where it was captured. This specimen has the eyes well-developed as in *Cardax*, but has no ocelli; the vertex of the head is free of the pronotum, as in *Alluaudella*, whilst the venation is unlike that of either genus.

During a recent visit to Peradeniya I had the good fortune to obtain several specimens of *Cardax willeyi*, all of which were males taken at light in Mr. Green's bungalow. These show considerable variation in their venation, and lead me to suppose that the differences in venation between *Cardax willeyi*, *Alluaudella cavernicola*, and the Kurseong species are of much less importance than appears at first sight. I propose therefore in the present paper to describe this variability in the venation of *Cardax willeyi*; to emphasize the fundamental uniformity found in the venation of the three species; to point out the probable relation of this type of venation to that found in other cockroaches; to

describe the Kurseong specimen under the name *Alluaudella himalayensis*; and to redefine the genera *Cardax* and *Alluaudella* in accordance with the fresh facts brought forward.

I have to thank Mr. Green for lending me his series of specimens of *Cardax willeyi*, including several of the collection of which the part sent to Shelford formed the basis of the original description of the species.

Variation in the venation of CARDAX WILLEYI, Shelford.

The venation of both the tegmina and wings of *Cardax willeyi* consists of a series of well-defined veins whose origin is practically coincident with the origin of the tegmen (or wing), and which run direct to the margin of that organ, giving off but few branches in their course; and of a series of "secondary" veins having as a rule no defined origin and lying singly between these "primary" veins as they may be termed. The branching of the primary veins is of two kinds. Firstly, branching near the origin, to form in all six long veins which it will be convenient to refer to as primary veins

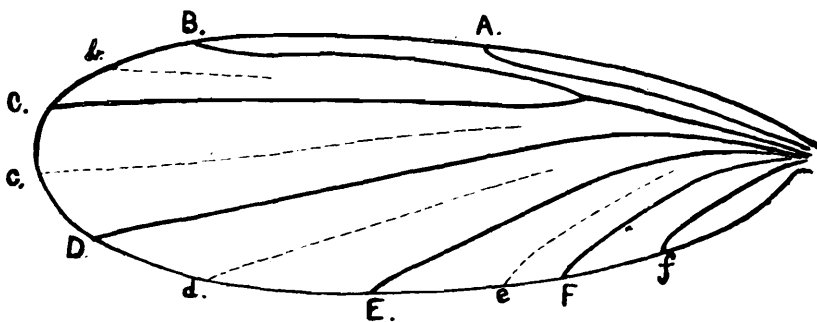


Diagram of the venation of the tegmen of CARDAX WILLEYI (♂).

The lettering of the veins corresponds to that used provisionally in the text; the probable relation of these veins to those found in more highly organized cockroach wings is described on p. 310. In the tegmen of *Cardax willeyi* the only difference between the nomenclature here advocated and that adopted by Shelford in his description is that Shelford regards "vein C" as a fork of the radial instead of as a distinct vein corresponding to the *vena spuria*. Primary veins are indicated by heavy lines; secondary ones by dotted lines. Vein *f* is shown by a heavy line, as it is at least as likely to correspond to a true branch of the anal (*i.e.*, to correspond strictly to an axillary vein of other forms) as to be one of the series of secondary veins which are here supposed to have possibly arisen *de novo* in the degenerate forms.

A—F respectively¹ (see text fig.); these branches arise in a manner which appears to be constant, and to be the same in all three species of cockroach particularly dealt with in the present paper, differing, however, in the tegmina and wings. And, secondly, branching which occurs nearer the margin of the wing, which is variable—except perhaps in the case of vein E of the wing which in every specimen I have seen is forked, the division occurring further

¹ In order to avoid confusion: the relation of these veins to those of more typical cockroaches will be considered later.

EXPLANATION OF PLATE XX.

o = ocellus.

x = rudimentary vein.

Fig. 1. *Cardax willeyi*, × 8. Dried specimen; from above.

Fig. 2. *Cardax willeyi*. Specimen mounted in Canada balsam; from above; the head extended forwards by pressure.

A. The whole, × 8.

B. Posterior end of abdomen, × 30.

Fig. 3. *Cardax willeyi*. Specimen mounted in Canada balsam; from below; the head extended forwards by pressure.

A. The whole, × 8.

B. Posterior end of abdomen, × 30.

Fig. 4. *Cardax willeyi*.

A. Left tegmen, × 8.

B. Right wing, × 8.

From a dried specimen.

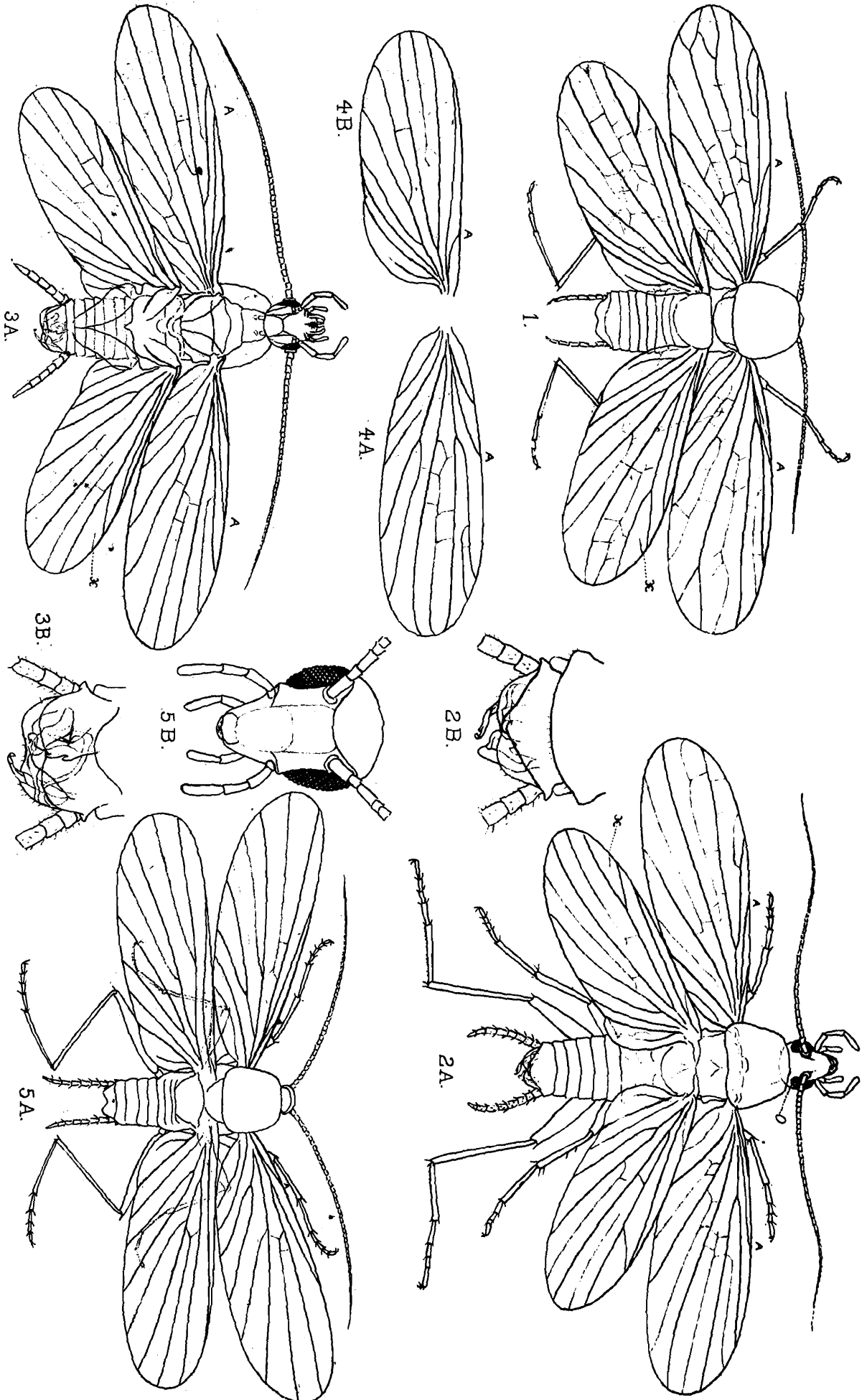
Fig. 5. *Alluaudella himalayensis*.

A. The whole from above, × 8.

B. The head from in front, × 35.

From a dried specimen (the type).

The specimens here figured are all preserved in the collection of the Indian Museum.



from the margin than in the case of any other vein. Thus vein D of the tegmen (anterior ulnar of Shelford's nomenclature) may be forked near the end (see fig. 1), and Shelford states that the posterior ulnar (vein E) may be similarly forked; and in the wing vein C may (figs. 1, 2 and 3) or may not (fig. 4B) be forked; and in the wing vein C may (figs. 1, 2 and 3) or may not (fig. 4) be forked.

But it is in the secondary veins (*b-f*) that the variations occur which are of special importance in connection with the relation between the types of venation found in these three species. These veins are usually connected with the primary veins between which they lie by a series of more or less ill-defined and very irregular cross-veins. The cross-veins are quite irregular in position, in number, and in intensity; and in some cases the secondary veins may appear to arise as definite branches of some primary vein, and in others very nearly to do so. Thus in the tegmen vein *b* often appears as a branch of vein B (see figs. 2 and 4A) or of vein C (see fig. 2); and in the specimen shown in fig. 3 vein *e* of both tegmina (but one more than the other) tends to appear as a branch of vein E and vein *c* of the right wing shows a strong tendency to appear simply as a branch of C and *d* of E.

Having thus established the fact that in *Cardax willeyi* the venation consists of a series of constant primary veins (any of which may, however, bifurcate near the margin of the wing), alternating with secondary veins, which show a tendency to fuse with them and so to appear as branches from them, the venation of *Alluaudella carvernica* and *A. himalayensis* can easily be shown to consist of the same elements somewhat more definitely combined. But before doing this it will be necessary to describe the new species *Alluaudella himalayensis*.

Description of ALLUAUDELLA HIMALAYENSIS, sp. n.

(Figs. 5A and 5B.)

♂ (one specimen only): size, pubescence and antennae as in *Cardax willeyi*; eyes well developed and far apart; ocelli absent; vertex of head not covered by pronotum; pronotum trapezoidal, punctured and pubescent behind and at the sides, with longer hairs more sparsely scattered over a central area extending as a narrow strip to the anterior margin; shape of pronotum, however, not so distinctly transverse as in *Cardax willeyi*. Tegmina and wings resembling those of *Cardax willeyi* in shape, size, texture and pubescence; mediastinal vein very short in tegmina, in the wings rudimentary (in one) or absent (in the other); radial vein rather faint in the tegmina, coincident with a longitudinal crease; no secondary vein developed in front of vein C (= *vena spuria*, see below p. 310) in tegmen or wing; base of vein C received by vein B (= radial) in the tegmen very close to the origin; vein E (= posterior ulnar) in the tegmen receives the base of the succeeding secondary vein (*e*), which is strongly developed and appears simply as a branch of it. Legs long and slender; apical spines of tibia