A REVISION OF THE GENUS OROLESTES (ORDER ODONATA).

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(Plate IV.)

The genus *Orolestes* was erected in the year 1895 by the late Mr. MacLachlan to accommodate a single species which he named *O. selysi* after the distinguished odontologist Baron de Selys Longchamps. Since then four other species have been added to the genus including one new species which is here described for the first time. The genotype was discovered in the N. E. Himalayas but the distribution of the genus is now known to extend as far east as Borneo, as Kirby's *Lestes wallacei,* from Sarawak, has since been transferred to *Orolestes.*

MacLachlan's original diagnosis of the genus was founded on the characteristics of *O. selysi* which has broadly coloured wings, but the discovery of two species in which the wings are completely hyaline has necessitated some modifications in this diagnosis. Laidlaw has also pointed out a grave error in the original description of the genus, that is, the dimensions of the discoidal cells, MacLachlan having given the length of the lower side as twice the length of the inner. The upper side was obviously intended and that this was so, was fully established by an examination of the genotype made by myself a few years ago.

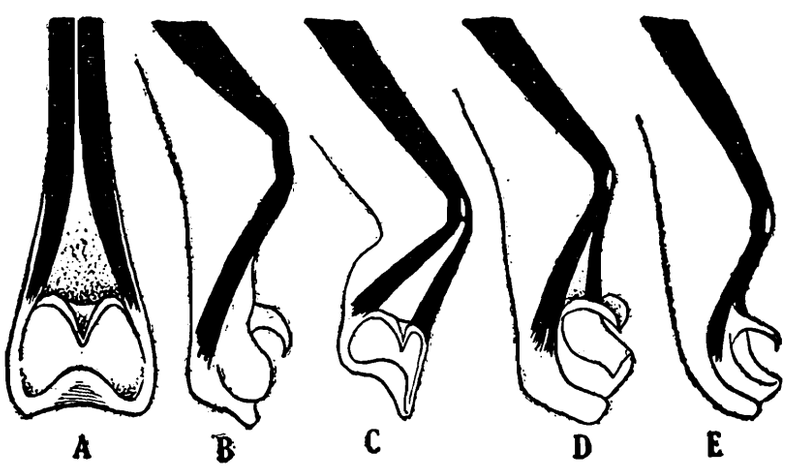
Employing the Tillyard notation, the diagnosis of the genus as revised, may now be given as follows :—

Zygopterous dragonflies of small, medium or of comparatively large size, with slender abdomen, narrow wings, a partially metallic green thorax and forcipated superior anal appendages. Wings hyaline or marked with spots, bands or fasciae of dark blackish brown ; petiolation extending as far as the nervure *AC*, which latter lies distinctly nearer the distal antenodal nervure ; discoidal cells equal in size and of the same shape in fore- and hind-wings, the posterior border nearly double the length of the costal and about three times the length of the basal, acutely pointed distally ; *Riii* arising $5\frac{1}{2}$ to 8 cells distad the node in the fore-wings, *IRii* 4 cells beyond *Riii ; Riv+v* and *IRiii* arising far proximal of the node ; none of the sectors zigzagged except *MA* and *IA* at their distal ends ; pterostigma of great length, covering from 4 to 7 cells poorly braced, slightly dilated at its middle ; intercalated rudimentary sectors present between *MA* and *Riv+v* and between the latter and *IRiii*, and others at the apical portion of wings. Legs slim, hind femora extending slightly beyond the posterior end of thorax ; middle and hind femora with a row of rather widely spaced spines ; tibial spines short, numerous.

Anal appendages long and forcipate, with an expansion on the inner border of superiors which ends in a robust acute spine ; inferior appendages shortly conical, inclined to be rudimentary ; penis with blunt apex which may project or be curled up at its middle part, cupped above and armed here with a short foliate spine. Vulvar scales robust, extending

to end of abdomen and armed below with several robust imbricated spines.

Habitat.—So far as at present known, the genus has a broken distribution from the N. E. Himalayas through Siam, Cambodia, and Tonkin to Borneo and Sumatra. Needham has described a larva which he opines belongs to *Orolestes* and if this is so, then, from the larval characters, the genus is undoubtedly a Synlestine. When however we come to examine the penile organs of the five species we find that they are closely similar to the same organ in *Austrolestes* and I am inclined to consider *Orolestes*, on this evidence, as a modern product of that genus. Needham's larva is more probably a *Megalestes* which genus is closely related to the Synlestinae and probably a genus of that subfamily.



TEXT-FIG. 1.—Penile organs of *A. Orolestes excelsa, sp. nov.*, dorsal view. *B.* The same seen in profile. *C. Orolestes selysi* MacL. semi-dorsal view. *D. Orolestes wallacei* (Kirby) semi-lateral view. *E. Austrolestes cingulatus* (Burm) seen in profile. (Contrast the latter with figure *B.*)

Needham's genus *Sinolestes* bears a remarkably close superficial resemblance to those species of *Orolestes* which have coloured wings, but the more proximal origins of *Riii* and *IRii* as well as the greater petiolation of the wings is sufficient to separate the two genera. *Orolestes* is separated from *Lestes*, *Austrolestes* and *Megalestes* by the more distal origin of *IRii* and *Riii* and by its greater petiolation.

Key to Species of *Orolestes*.

1.	Wings of male broadly marked with blackish brown	2.
	Wings of male hyaline . .	3.
2.	Wings of male with a broad unbroken fascia extending from proximad the node as far as the pterostigma . . .	*O. selysi* MacLach.
	Wings of male with a large spot beneath the pterostigma and a broad fascia just distad the level of node	*O. octomaculata* Mart.
	Wings of male with similar markings to the last but the preapical spot extending right across the wings and broadly confluent with the subbasal fascia. A much larger species than the last, abdomen 60 mm. compared to 52	*O. excelsa*, sp. nov.
3.	Ground-colour of prothorax and thorax light reddish brown; inferior anal appendages separated . .	*O. udeana* (Krug).
	Ground-colour of prothorax and thorax pale bluish green or blue; inferior anal appendages closely apposed	*O. wallacei* (Kirby).

Orolestes wallacei (Kirby).

(Plate IV, fig. 1.)

Lestes wallacei Kirby, *Proc. Zool. Soc. Lond.* p. 302 (1889); *id. Cat. Odon.* p. 162 (1890); Laid. *Proc. Zool. Soc. London*, pp. 340, 341 (1920).
Lestes ridleyi Laid. *Proc. Zool. Soc. London*, p. 92 (1902).
Orolestes wallacei Laid. *Rec. Ind. Mus.* XIX, text-fig. 1 (1920); Ris., *Zool. Mededeel, S'Rijks Mus. Nat. Hist. Leiden*, X, Af, I, p. 13 (1927), Laid. *Proc. Zool. Soc. Lond.* pp. 134, 135 (1928); *id. Journ. F. M. S. Mus.* XVI, p. 184 (1930); id. *ibid* p. 246 (1930).

Male. Abdomen 48 mm. Hindwing 28 mm.

Head: labium dirty white; labrum, bases of mandibles and genae pale azure blue; rest of head including antennae blackish brown, the occiput streaked obliquely with ochreous behind and entirely so below; eyes dark brown, probably dark blue during life.

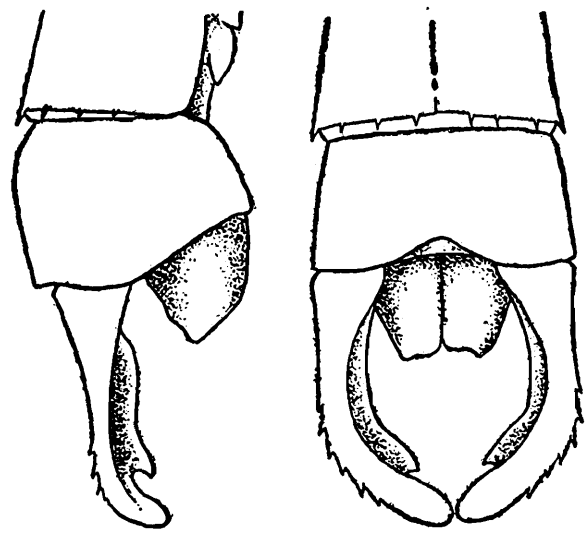
Prothorax: pale olivaceous, the posterior lobe and a broad middorsal area on the middle lobe reddish brown.

Thorax: coppery metallic green on dorsum, the middorsal carina broadly black, a narrow bluish green antehumeral stripe separating the metallic area from the humeral suture, after which is a broad reddish brown stripe covering the anterior half of the metepimeron, the upper half of this stripe golden or coppery metallic; rest of sides and beneath, uniform pale blue.

Legs: reddish brown, flexor surfaces of femora blackish brown.

Wings: hyaline, apices of all and costal space as far as from node to pterostigma palely enfumed; pterostigma dark reddish brown, covering $3\frac{1}{2}$ to $4\frac{1}{2}$ cells, braced; 19 to 20 postnodal nervures to forewings, 17 to 18 to the hind; *Riii* arising from $6\frac{1}{2}$ to 7 cells distad the node, *IRii* 3 to 4 cells beyond *Riii*.

Abdomen very long and slender, pale blue or greenish blue on segment 1 and sides of segments 2 to 5, the dorsum black from segment 2 to 7; narrow pale blue basal annules on segments 3 to 7 which are confluent with the blue on the sides of the anterior segments; segments 8 to 10 entirely azure blue.



TEXT-FIG. 2.—Anal appendages of *Orolestes wallacei* (Kirby) ♂ right lateral and dorsal views.

Anal appendages black; superiors nearly twice the length of segment 10, the distal halves curved strongly in so that the apices meet in the

middle line, the middle two fourths expanded on the inner side, deeply concave and ending in a robust subapical inner spine ; apices moderately acute, the outer border spined ; inferiors nearly half as long as the superiors, closely apposed, blunt conical processes. Penis with a broad apex which projects as a short process as seen in profile, cupped above, the cup with a shallow collar anteriorly and with a broad short spine at its posterior part, the apex of which curls strongly forward ; closely similar to the penis found in the genus *Austrolestes*. Female unknown.

Habitat.—Sarawak, Borneo ; Bettotan, Borneo from July to August. Differs like *O. udeana* (Krug.) from other species of the genus in having the wings unmarked with dark spots or bands. For the differences between it and the latter species see below under the description of *O. udeana*.

Orolestes udeana (Kruger).

Lestes udeana Kruger, *Stett. Ent. Zeit.* LIX, pp. 130, 131 (1898).
Orolestes udeana Ris., *Zool. Mededeel. Zool. Rijk's Mus. Nat. Hist. Leiden*, X, pp. 11-15, text-fig. 4 to 6 (1927).

Male. Abdomen 47 mm. Hindwing 30 mm.

A clear-winged species like the last and distinguished by the following characters. The ground colour a pale reddish brown instead of pale blue or bluish green ; the occiput clouded with white instead of blackish brown streaked with ochreous. (The author does not give the colour of the labrum, bases of mandibles or genae so presumably these are included in the reddish brown of upper surface of head.) There is a zigzagged green metallic transverse stripe above the frons of *O. udeana* which is absent in *O. wallacei ;* the thorax apart from the ground colour is very similar in the two insects ; the legs are paler in *O. udeana*. The abdomen is similarly marked but the colour of the end segments 8 to 10 is given as dull dark brown for *O. udeana* with a note appended suggesting that they are paler in the living state ; I think that there can be no doubt but that they are pale blue in this state and the dark colouring in the type is due to the effects of decomposition. Lastly the apices of the inferior anal appendages of *O. udeana* are well separated and less than half the length of the superiors, whereas they are closely apposed and at least half the length of the superiors in *O. wallacei*.

This species is the only one in which the female has been described, the vulvar scales possessing a row of robust imbricated ventral spines.

Habitat.—Sumatra. Type, allotype female and paratypes all in the Leiden Museum.

Orolestes selysi MacLachlan.

(Plate IV, fig. 2.)

Orolestes selysi MacL. *Ann. Mag. Nat. Hist.* (6) XVI, pp. 21-23 (1895) ; Mart. *Mission Pavie* (sep) p. 18 (1904) ; Laid. *Rec. Ind. Mus.* XIX, pp. 148-150 (1920) ; *id. Proc. Zool. Soc. Lond.* Pt. I, pp. 134, 135 (1928) ; Fras. *Journ. Bombay Nat. Hist.* XXXIII, pp. 838, 839 (1929) ; (Larva ?) Needham, *Ent. News*, XXII, pp. 342-344, pl. XI, figs. i to iv. (1911).

Male. Abdomen 57—60 mm. Hindwing 36—42 mm.

Head : labium sulphur yellow ; labrum and bases of mandibles turquoise blue ; rest of head black marked with a narrow reddish brown interrupted stripe at level of posterior ocelli and streaked with dull

ochreous on the occiput; the inner and posterior parts adjacent to the posterior ocelli metallic emerald green; beneath head pale ochreous; eyes brown but probably blue during life.

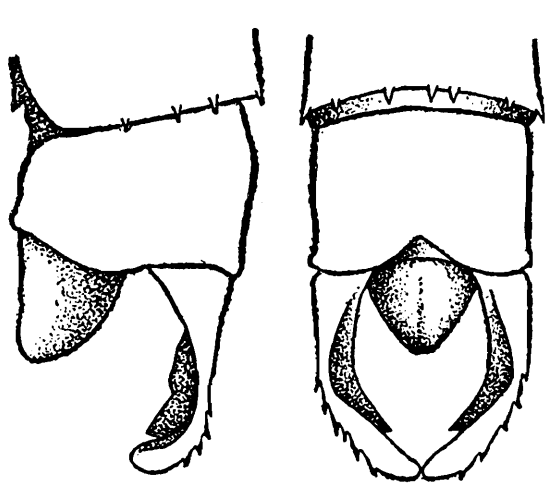
Prothorax: bluish green heavily pruinosed white on the sides; posterior lobe large and broadly arched.

Thorax: olivaceous on dorsum marked with a broad metallic emerald green antehumeral stripe on each side which extends from the antealar sinus to the lower part of dorsum; antealar sinus also marked with bright green; laterally pale olivaceous with two broad oblique bright sulphur yellow stripes, one on the antero-lateral suture and the other running along the ventral border of thorax; beneath yellowish white.

Wings: hyaline at apices and extreme base, blackish brown in between these areas, the dark area ending outwardly at the proximal end of pterostigma or one to two cells proximal or one to two cells distal of that level, the outer margin somewhat irregular, slightly crenate in the type, ragged and sinuous in a specimen from Siam and deeply concave in Dr. Schmidt's specimen, the inner end oblique and extending variably nearly up to or actually over the discoidal cells and sending a prolongation in the subcostal space which may extend nearly to base of wings; the cell middles and borders over some parts of this dark area paler so that each cell appears to include a broad diffuse dark ring; origin of *Riii* somewhat variable, from 7 to 8 cells distad the node in forewings and from $5\frac{1}{2}$ to $6\frac{1}{2}$ in the hind. *IRii* arising 3 to 4 cells after *Riii;* discoidal cells as for genus (In the type these cells are distinctly longer and more narrow than in my specimen from Siam). Pterostigma very long and markedly dilated at the middle, dark brown enclosed in thick black nervures, poorly or not braced; below this organ the hyaline portion of wing bears a cloud of opalescence which is much broader and far more conspicuous in the Siam specimen than in the type; this cloud shows in the figure on Plate IV as a dark diffuse cloud; 21—24 postnodals in forewings, 20 in the hind.

Legs: blackish brown; coxae and trochanters bright yellow.

Abdomen: segment 1 bluish green with a middorsal patch of metallic emerald green; segment 2 broadly bluish green on the sides, the middorsal



TEXT-FIG. 3.—Anal appendages of *Orolestes selysi* MacL. ♂ left lateral and dorsal views.

carina narrowly ochreous and with a very broad metallic emerald green stripe on each side of it which broadens apically and becomes confluent

at extreme apex of segment; segment 3 very similar but the blue on the sides extending up over dorsum narrowly at base to form a basal annule; segment 4 similar but the middorsal carina marked with ochreous only on its basal portion which also bears a basal blue annule; segments 5 to 7 dark cupreous blackish brown; 8 to 10 black (but with irregular paler areas showing up in the specimen from Siam so that one gets the impression that these segments are actually pale blue during life).

Anal appendages : superiors blackish brown, curved regularly towards each other so that the apices meet; about half as long again as segment 10, spined on the outer side and with a broad deeply cupped expansion at the middle two fourths of inner side; apices bluntly pointed. Penile organ rounded and very broad at apex, the central portion of this border curled up and back; a prominent curling dorsal spine above. Female unknown.

Habitat.—The type comes from Darjeeling, Bengal, but Martin has reported the species from Tonkin and I have a specimen taken by Dr. Kerr in Siam. I have no data as to where Dr. Schmidt obtained his example. The Siamese specimen is considerably larger than the type and presents some differences in markings which I think are due to the effects of decomposition in the latter but if not, then it is probably not more than a local race differing by the broader extent of the dark areas of wings and by the metallic green antehumeral stripes on thorax and similar markings on the basal abdominal segments and dorsum of head. All these markings are definitely brilliant metallic as contrasted with the " bronzy green " of the type. The less extent of the dark area in Dr. Schmidt's example, this area also deeply concave outwardly, suggests that a number of varieties exist.

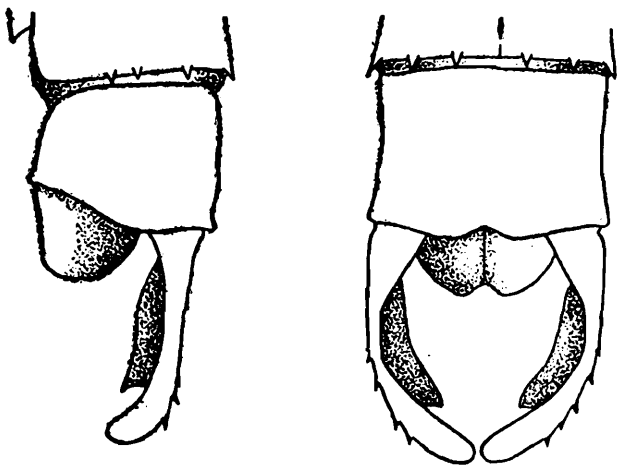
Orolestes octomaculata Martin.

(Plate IV, fig. 4.)

Orolestes octomaculata Mart. *Mission Pavie* (sep.) p. 19 (1904); Laid. *roc. Zool. Soc. London,* Part I, p. 135 (1928); Fras. *Journ. Siam Soc.* (*Nat. Hist. Suppl.*) VIII, No. 4, pp. 293, 294 (1932).

This species was described from an unique specimen from Cambodia and now in the Museum, Jardines des Plantes, Paris. After remaining the sole specimen known for over forty years it was rediscovered by Dr. A. F. Kerr in Lower Siam, another single male being taken, which is at present in my collection. The new specimen shows a number of minor differences in the extent of the blackish brown markings of the wings and the venation. *Riii* arises only 6 cells distad the node in the forewings as against 7½ in the type and 5½ cells in the hindwings of both; *IRii* begins 5 cells after *Riii* in the forewings, but only 2½ in the hind; *AC* is situated exactly midway between the two antenodal nervures in forewings, but nearer the distal antenodal in the hind; the discoidal cells are similar to those of *O. selysi.* The apical spots begin well before the pterostigma and extend outwards to slightly beyond the middle of that organ. The colouring and markings are an extraordinary close

repliqua of those of *O. selysi* but the green metallic areas on head, thorax and abdomen are more of the nature of golden coppery metallic; the



TEXT-FIG. 4.—Anal appendages of *Orolestes octomaculata* Mart. ♂ left lateral and dorsal views.

labrum and bases of mandibles are turquoise blue. In size the species is comparable to *O. wallacei* and much smaller than *O. selysi* or *excelsa.*

Orolestes excelsa, sp. nov.

(Plate IV, fig. 3).

Male. Abdomen 60 mm. Hindwing 39 mm.

Head: labium pale yellow; labrum, genae and anteclypeus dull turquoise blue; rest of head dark reddish-brown; the occiput spotted and, behind the eyes, striped with ochreous.

Prothorax: olivaceous, the middorsum from the posterior to anterior lobe paler, a diffuse bronzed black spot on either side of dorsum of middle lobe and some irregular reddish-brown clouding on the posterior part of same and on the posterior lobe.

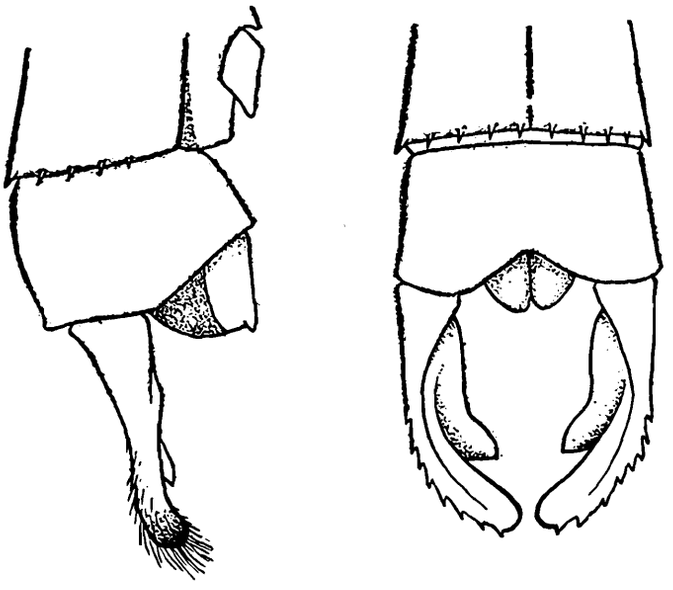
Thorax: with middorsum broadly dark reddish-brown, on each side of which area a broad metallic green band extends from the antealar sinus to the anterior border of thorax followed or bordered outwardly by an equally broad dark olivaceous brown band which extends laterally nearly to the antero-lateral suture; laterally pale bluish green thinly pruinosed posteriorly and below; beneath thorax snowy white with pruinescence.

Legs: warm reddish-brown with numerous robust, rather long and gradually lengthening spines on the two hind pairs of femora.

Wings: partly hyaline, each with a broad blackish brown fascia shaped like a broad mark of exclamation lying on its side, the head of the marking situated near apex of wings and its base extending to slightly proximal the level of node and covering the whole of the surface of the wings as far out as slightly distal the pterostigma except for a large, triangular hyaline area on the posterior border of wings with its centre slightly distal the centre of wings and extending as far forwards as *IRiii.* The costal space opposite this and as far out as the pterostigma hyaline so that the marking is greatly constricted at this point. Pterostigma very long, expanded at its middle (5 mm.), unbraced, covering about

6 cells, dark reddish-brown between thick black nervures; 19 postnodal nervures in forewings, 16-17 in the hind; *Ac* lying nearer the distal antenodal nervure; discoidal cells of about the same size and shape in all wings; *Riii* arising about the level of the 6th or 7th postnodal nervures, and much nearer the node than to pterostigma.

Abdomen: very long and slender, its surface finely rugose, uniform dark brown changing to black on the end segments; segments 1 and 2 bluish at the sides, the latter segment with a fine longitudinal pale olivaceous middorsal stripe.



TEXT-FIG. 5.—Anal appendages of *Orolestes excelsa*, sp. nov. ♂ left lateral and dorsal views.

Anal appendages: black; superiors nearly half as long again as segment 10, narrow, forcipate, coarsely spined outwardly and with a narrow shell-like expansion occupying the middle two fourths of its inner border and ending in a robust incurved spine; inferior appendages stout, conical, closely apposed processes about one third the length of superiors.

Habitat.—Chaiyabari, N. E. Siam. A single male taken by Dr. A. Kerr, 3rd May 1932, in scrub beside a river, resting with its wings slightly raised and spread out at an angle of about 10—15 degrees from the horizontal. Closely allied to *O. selysi* and *O. octomaculata* but a larger insect and with the wings quite differently marked.