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BY

F. A. PERKINS, B.Sc.Agr.

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Five new species from Queensland and one from Tasmania of the genus *Trinotoperla* Tilly. are described. The male of *T. nivata* Kim. is described for the first time. The diagnosis of the family *Gripopterygidae* is expanded to include morphological features not previously described. Tables are included to show the variation in wing venation in *groomi* sp.n. A key to the species of the genus *Trinotoperla* is included.

Introduction

During the last thirty years over 240 collections of Plecoptera have been made by the staff and students in the Department of Entomology, University of Queensland. This is the first of a short series of papers which will deal with all the material available. The task has been made much easier by the publication in 1951 of a very good paper by D. E. Kimmins entitled "A Revision of the Australian and Tasmanian Gripopterygidae and Nemouridae (Plecoptera)". He rendered great assistance to Australian students by examining and, where necessary, redescribing type material in the British Museum.

Stone-flies, although reasonably common in S.E. Australia and Tasmania, are extremely difficult to find in Queensland and as a general rule occur only in small numbers in rather inaccessible mountain streams.

Most of the material was fixed in Carnoy and then preserved in alcohol and glycerine. Pinned and set specimens although satisfactory for the study of wing characters are most unsuitable for other morphological features. Collectors are strongly advised to preserve specimens rather than pin and set them.

Unless otherwise stated all holotypes, allotypes, hypotypes and paratypes have been fixed in Carnoy and preserved in alcohol and glycerine.

GRIPOPTERYGIDAE Enderlein

Gripopterygidae Enderlein, 1909, *Zool. Anz.* 34: 388; Kimmins, 1951, *Bull. Brit. Mus. (Nat. Hist.) Ent.* **2** (2): 46.

Leptoperlini Banks, 1913, *Trans. Amer. ent. Soc.* **39**: 202.

Leptoperlidae Tillyard, 1921, *Canad. Ent.* **53**: 36; 1921, *Trans. Roy. Soc. S. Aust.* **45**: 270-273; 1923, *Trans. N.Z. Inst.* **54**: 202-203; 1926, Ins. Aust. & N.Z.: 119.

Although this paper deals primarily with the species of the genus *Trinotoperla*, in order to save repetition in subsequent descriptive work, an expanded diagnosis of the family is included. Tillyard (1921) and Kimmins (1952) in their diagnoses concentrated on the shape and venation of the wings and paid little attention to other morphological features. The following diagnosis is based on a study of three of the four described genera and a genus yet to be described. The genus *Eunotoperla* Tilly. was not represented.

Diagnosis of the family.

Head. Epicranium and frons, when viewed from above, sub-hexagonal in shape, the greatest width, at the level of, and including the hemispherical protuberant eyes, being slightly more than the length. Lateral ocelli almost opposite the mesial

angle of the eyes to which they are closer than to one another; median ocellus closer to anterior margin of frons than to the lateral ocelli. Angle of the epicranial suture wide, varying from 120° to 160°, and about level with the mesial angle of the eyes. Antennae nearly as long as or longer than the body with from 30 to over 60 segments; scape as long as wide; pedicel half as long and half as wide as scape. Maxillary palp about as long as the first 3 or 4 antennal segments; first segment as long as wide, second and fourth segments slightly longer than first; third segment longer than third and fifth slightly longer than third. Labial palp short and barely projecting beyond the tip of the paraglossa. Glossae and paraglossae about equal, as long as wide. Mentum variable.

Thorax. Meso and meta basisterna large and conspicuous, varying even intra specifically in shape. Furcal invaginations conspicuous in the sternellum of each segment. A distinctive Y shaped endosternal ridge in the mesosternellum. Pronotum sub-trapezoidal, length and breadth differing only slightly; marginal flange wide and raised; marginal furrow and dorsal suture distinct.

Legs. Characteristic of order.

Wings as defined by Kimmins (1951).

Abdomen. Terminalia variable. Cerci with more than six segments variable in length and in number of segments.

Nymphs as defined by Tillyard (1921).

Key to Genera of Gripopterygidae in Australia and Tasmania

1. Rs forked in both pairs of wings 2
   Rs simple in both pairs of wings 3
2. A series of cross-veins between CuP and 1A in forewing .. .. *Eunotoperla* Tilly.
   Not more than one cross-vein in this area .. .. *Trinotoperla* Tilly.
3. Hindwing with M_{3+4} separate from CuA (*new genus to be described in subsequent paper*)
   Hindwing with M_{3+4} wholly or partially fused with CuA 4
4. Hindwing with M_{3+4} and CuA separate at base and apex and fused in middle of the wing *Dinotoperla* Tilly.
   Hindwing with M_{3+4} and CuA separate at base, fused from centre of wing to margin *Leptoperla* Newm.

Genus *TRINOTOPERLA* Tillyard

Trinotoperla Tillyard, 1924, *Trans. Roy. Soc. S. Aust.* **48**: 193; Kimmins, 1951, *Bull. Brit. Mus.* (*Nat. Hist.*) *Ent.* **2** (2): 75.
Type species: *T. irrorata* Tillyard, 1924 (fixed by Tillyard, 1924).

Diagnosis of Genus

A genus of medium to large species (body length 10-20 mm. and forewing 10-25 mm.) brown to dark brown mottled species with the following constant black markings on the thorax:—On both the meso and metathorax at lower angles of episterna, near insertion of the legs and (usually) apex of the postnotum. *Antennae* almost as long as body with from 45 to over 60 segments, fourth segment distinctly shorter than adjacent segments and about half as long as the third segment. *Pronotum* slightly wider than long, anterior margin curved, marginal flanges distinct and raised, the anterior and posterior usually broad. A symmetrical impressed pattern on either side of the dorsal suture. *Cerci* short (about 1/6 length of body) with from 12-26 segments. *Forewings* with Rs two or three branched. M. forked near middle of the wing; CuA two or three branched; cubito-anal space with only a basal cross-vein; a thickened cross-vein between 1A and 2A. Hindwings with Rs two branched;

M two branched; M3+4 soon fusing with CuA and separating again some distance from the wing margin; anal fan rather narrow, with or without cross-veins.

Distribution. Australia and Tasmania.

A feature of the genus is that the colour pattern of the epicranium and frons is surprisingly constant specifically, far more so than the wing venation and colour pattern of the sub-genital plate.

Key to species of *Trinotoperla*

1.	Costal cross-veins present	2
	Costal cross-veins absent	4
2.	Cross-veins between 1A and 2A	*nivata* Kim.
	Cross-veins between 1A and 2A absent	3
3.	Angular lobe in forewing at end of CuA3	*irrorata* Tilly.
	No such lobe	*woodwardi* sp.n.
4.	Pterostigmatic cross-veins present	5
	Pterostigmatic cross-veins absent	9
5.	Cross-veins between 1A and 2A present	6
	Cross-veins between 1A and 2A absent	7
6.	Anal lobe with numerous cross-veins. Forewing 15-18 mm.	*groomi* sp.n.
	Anal lobe with 0 or 1 cross-veins. Forewing 11 mm.	*minor* Kim.
7.	Sub genital plate in ♀ bilobed	*hardyi* sp.n.
	Sub genital plate in ♀ not bilobed	8
8.	Costal cells with a row of greyish brown blotches	*yeoi* sp.n.
	Costal cells without blotches	*mayi* sp.n.
9.	Epiproct toothed below	*australis* Tilly.
	Epiproct toothed above near base	*franzeni* sp.n.

Trinotoperla groomi sp.n. (Fig. 1, 2)

Holotype female. Head with a distinctive and constant colour pattern in dorsal view, the chief features being the dark ocellar triangle, sub-rectangular pale area in front of the median ocellus, epicranium brown with a paler central area, and distinct pale areas indicating the attachments of the dorsal tentorial arms. Antennae shorter than the body with 46 segments.

Thorax with colour pattern similar to other members of the genus. Posterior margin of metabasisternum straight. *Legs* fulvous with the following brown to fuscous markings on each leg:—longitudinal femoral streaks, base of tibia, apices of femur and tibia, and tarsus. Antero-ventral ridge of each femur produced into a sharp apical tooth. *Wings* with all veins slightly shaded, with darker markings beneath C and between 1A and 2A in the forewing; hind wings paler. Cross-veins of left wings as in Fig. 1 *d*.

Abdomen pale, almost white, with 10th tergite, posterior lateral corners of sternites, and 8th, 9th and 10th sternites with fulvous and fuscous markings.

Terminalia. Apical margin of subgenital plate produced a little with the centre slightly concave. Colour pattern as in Fig. 1 *c* (intensity varies considerably in other specimens but generally a median longitudinal line and basal margin nearly black). Paraprocts slightly incurved and pointed apically. Cerci short (2-3 mm.) with 16 segments.

Allotype male, somewhat teneral.

Colour pattern of head, thorax and legs similar to female. Antennal segments, right 50, left 44 (damaged).

Terminalia. Tenth tergite from above produced into an equilateral triangular membranous lobe. From the side as in Fig. 1 *b, c*. Epiproct in profile with basal half moderately thick,

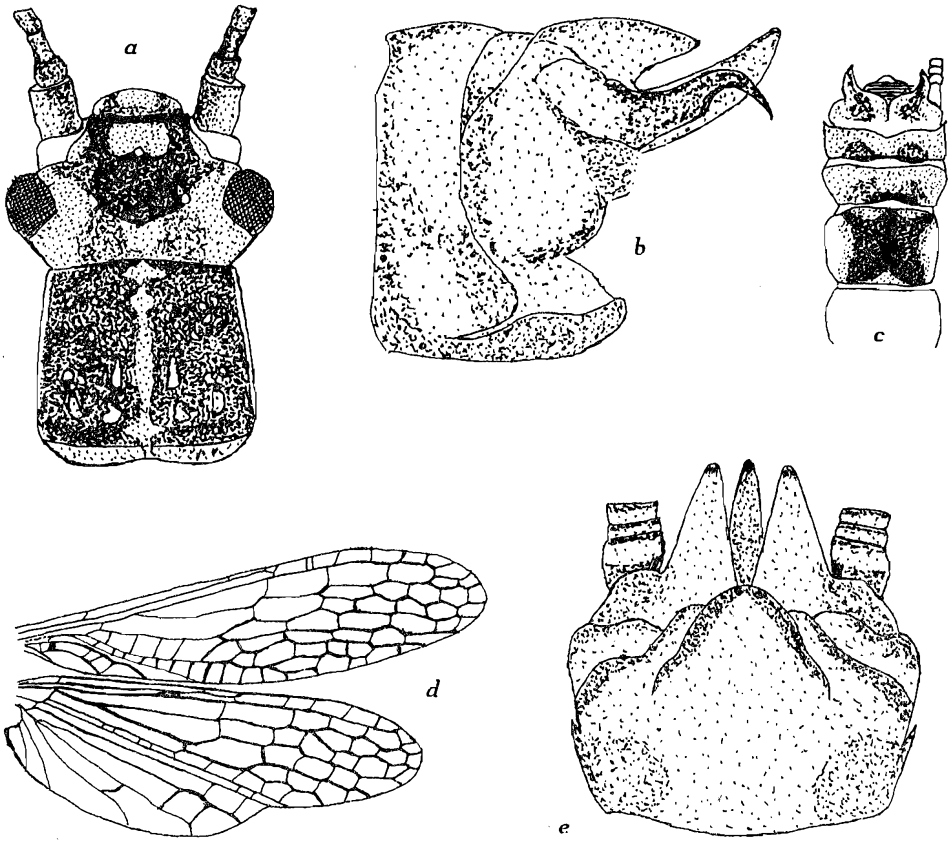

FIG. 1—*T. groomi* sp.n. *a* Head and pronotum from above; *b* male terminalia from side (cerci and left paraproct omitted); *c* female terminalia (ventral view); *d* right wings; *e* male terminalia (ventral view).

apical half curving downward to form a long sharp spine darkened at the tip. Paraprocts as in Fig. 1. Subgential plate prominent with rounded apex. Cerci with 15 segments.

Measurements. Female, body, 17.7 mm.; forewing, 18.7 mm.; hindwing, 16.5 mm. Male, 12 mm.; forewing, 16.5 mm.; hindwing, 13.5 mm.

Localities: Queensland: *Lamington Nat. Park* (9 females, 31.v.1929; 1 male, 8.iv.1939; 1 male, viii.1947; 1 male 12 females, 1.v.1955; 31.v.1955, F. A. Perkins), (1 female, 5.vi.1942, I. E. Common), (2 males 8 females, 2-6.v.1956, 1 female, 20.viii. 1956, I. C. Yeo). *Killarney* (1 male, 3.iv.1955, N. Loveday). *Natural Arch, Numinbah* (1 male, 1.xi.1954, F. A. Perkins). *Highvale* (1 male, 30.iii.1955, R. E. Harrison). *Mt. Nebo* (1 male, 15.vii.1955, D. Woodland), (2 females, 17.vi.1955, 1 female, 14.vii.1955, W. R. Horne). *Bunya Mtns.* (42 females, 30.ix.1954, J. L. Groom and A. W. May), (1 female, 10.viii.1955, T. E. Woodward). *Mapleton* (2 females, 12.iv.1952, J. G. Morris). *Eungella Range* (1 male, 17.vi.1956, A. W. May), (2 males 3 females, 27.v.1956, T. E. Woodward).

Types. Holotype female (T 5670) from Bunya Mtns., and allotype male (T 5671) from Natural Arch, S.E. Queensland presented to Queensland Museum. Paratypes 11 males and 67 females.

This species is named after Mr. J. L. Groom, who was one of the collectors of the type series and who has been interested in Plecoptera since his student days.

Discussion. This species resembles *nivata* Kim. and *minor* Kim. in having a series of cross-veins between 1A and 2A in the forewing and in the shape of the paraprocts in the female, but differs from *nivata* in having a complete series of cross-veins between C and Sc, and from *minor* in size, the shape of the epiproct in the male and the numerous veins in the anal fan. It is somewhat variable in size, number of segments in antennae and cerci, in the number of cross-veins and forking of the branches of Rs and CuA. Constant features are the colour pattern of the top of the head, absence of cross-veins in basal two-thirds of the second costal cell, presence of complete series of pterostigmatic cross-veins, a series between 1A and 2A in the forewing and numerous (6-11) cross-veins in the anal fan. In order to obtain some idea of the variation in the species, with the hope of finding additional specific and perhaps generic characters, a careful study was made of 20 females collected on the same day in the same locality, with the following results.

Range and Distribution

								Type
Length of body in mms.	Range	15·5	16·0	16·5	17·0	17·5	18·0	17·7
	Frequency	3	4	4	5	3	1	
*Antennal segments	Number	44	45	46	47	48		46
	Frequency	3	5	5	3	3		
†Segments in cerci	Number	13	14	15	16			16
	Frequency	7	17	6	4			

*The type was the only specimen with the same number of segments in both antennae. The numbers quoted above are possibly incomplete, although there is an indication that 48 is the maximum number of segments in the species.

†In 8 specimens both cerci consisted of 14 segments, in 2 of 13 segments, in 2 of 15 segments, in 2 of 16 segments.

Range and distribution of wing cross-veins

										Type	
Forewing:										Left wing	Right wing
Cross-veins between	C and Sc	number		1	2		3			2	2
		frequency		13	24		3				
,,	C and R_1	number	4	5	6	7	8	9	10	6	7
		frequency	1	1	14	14	8	1	1		
,,	R_1 & R_{2+3}	number	4	5	6	7	8			5	4
		frequency	1	5	13	17	4				
,,	R_{2+3} & R_{4+5}	number	3	4	5	6				4	4
		frequency	3	20	12	5					
,,	R_{4+5} & M_{1+2}	number	6	7	8	9	10			8	6
		frequency	1	11	17	7	4				
,,	M_{1+2} & M_{3+4}	number	5	6	7	8				7	5
		frequency	2	13	14	11					
,,	M_{3+4} & CuA_1	number	11	12	13	14	15	16		12	11
		frequency	1	6	7	10	7	8			
,,	CuA_1 & CuA_2	number	3	4	5	6	7	8		3	6
		frequency	4	6	14	10	5	1			
,,	CuA_2 & CuA_3	number	1	2	3	4	5			2	1
		frequency	5	18	10	6	1				
,,	CuA_3 & CuP	number	10	11	12	13	14	15	16	12	12
		frequency	4	4	13	8	8	1	2		

,,	CuP & 1A	number	0	1	2	3	4					1	1
		frequency	2	28	2	1	1						
,,	1A & 2A	number	2	3	4	5	6					2	3
		frequency	1	12	19	7	1						
Hindwing:													
Cross-veins	C & Sc	number	1	2	3	4						1	1
between		frequency	17	15	7	1							
,,	C & R_1	number	3	4	5	6	7	8	9			6	5
		frequency	2	4	11	14	7	1	1				
,,	R_1 & R_3	number	4	5	6	7	8					4	5
		frequency	5	12	17	5	1						
,,	R_{2+3} & R_{4+5}	number	2	3	4	5	6					2	3
		frequency	8	20	9	0	3						
,,	R_{4+5} & M_{1+2}	number	4	5	6	7	8	9				6	7
		frequency	1	7	19	8	4	1					
,,	M_{1+2} & M_{3+4}	number	3	4	5	6	7	8	9			5	4
		frequency	1	6	13	11	4	2	3				
,,	M_{2+4} & CuA_1	number	2	3	4	5	6					1	3
		frequency	2	19	15	2	1						
,,	CuA_1 & CuA_2	number	6	7	8	9	10	11	12	13	14	10	10
		frequency	2	2	7	4	11	4	7	2	1		
,,	CuA_2 & 1A	number	0	1	2	3	4	5				2	2
		frequency	4	6	18	10	1	1					
,,	1A & $2A_1$	number	1	2	3	4	5	6				3	2
		frequency	2	5	11	16	5	1					
,,	$2A_1$ & $2A_2$	number	2	3	4							2	2
		frequency	16	17	7								
,,	$2A_2$ & $3A_1$	number	1	2	3	4						1	1
		frequency	6	17	14	3							

Other wing measurements. (Lengths in mms.)

Forewing:												
length	15·5	16	16·5	17	17·5	18	18·5	19	19·5	20	18·5	18·5
frequency	1	1	0	2	5	6	9	10	4	2		
Hindwing:												
length	14	14·5	15	15·5	16	16·5	17	17·5			16·5	16·5
frequency	2	0	2	4	10	13	7	2				

The figures show that the number of cross-veins in each series is subject to considerable variation. In practically every case, however, at least some cross-veins were present.

An attempt was also made to find out whether the position of the forks and the length of the branches of the main veins was at all constant. The method o measuring is shown in Fig. 2.

$\frac{\text{Length}}{\text{Width}}$ Index					Type Left	Type Right
Index	3·83—4·0	4·01—4·2	4·21—4·4	4·41—4·6	4·55	4·36
Frequency	14	4	14	8		
$\frac{\text{Rs}}{R_{4+5}}$ Index						
Index	·9—1·30	1·31—1·90	1·91—2·50		1·15	1·11
Frequency	22	9	8			
$\frac{\text{M}}{M_{3+1}}$ Index						
Index	·341—·440	·441—·540	·541—·640		·464	·432
Frequency	8	27	5			

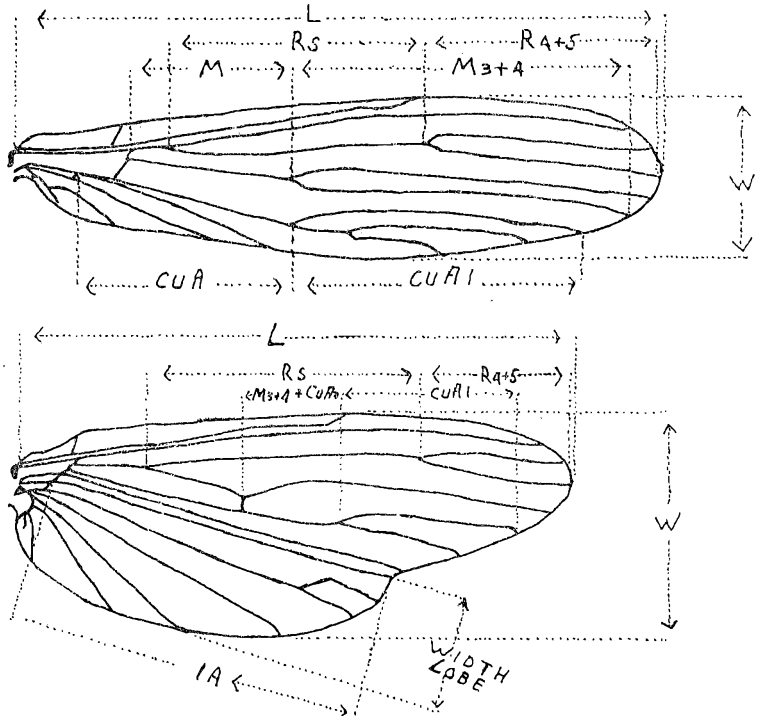

FIG. 2—Wings of *Trinotoperla* (main veins only) to show how measurements for indices were made.

$\frac{CuA}{CuA_1}$ Index

Index	·591—·690	·691—·790	·791—·890			·770	·796
Frequency	12	19	6				

Hindwing

$\frac{\text{Length}}{1A}$ Index

Index	1·421—1·48	1·481—1·54	1·541—1·60	1·601—1·66	1·661—1·682	1·56	1·58
Frequency	8	12	16	3	1		

$\frac{1A}{\text{Width of fan}}$ Index

Index	3·12—3·2	3·21—3·4	2·41—3·6	3·61—3·8	3·81—4	3·67	3·69
Frequency	1	13	11	12	3		

$\frac{Rs}{R_{4+5}}$ Index

Index	·88—1·28	1·29—1·68	1·69—2·08	2·09—2·48	2·49—2·86	2·03	1·87
Frequency	4	10	9	3	4		

$\frac{M}{M_{1+2}}$ Index

Index	·411—·470	·471—·530	·531—·590	·591—·650	·651—·683	·583	·596
Frequency	4	2	18	13	3		

$\frac{M_{3+4} + CuA}{M_{3+4}}$ Index

Index	·250—·450	·451—·650	·651—·793			·542	·793
Frequency	33	6	1				

$\frac{Rs + M}{M}$ Index

Index	·290—·350	·351—·410	·411—·470	·471—·530		·346	·285
Frequency	12	12	5	11			

It will be seen that the range in most cases is rather wide, the possible exceptions being: Length ÷ Width Index in the forewing and the Length ÷ 1A and 1A ÷ width of fan in hindwing.

The following table gives a comparison with preserved specimens of other species selected at random.

	groomi	*franzeni*	*yeoi*	*mayi*	*woodwardi*
Body Length	15·5 —18	10	10	17	19·3
Forewing					
Length in mms.	15·5 —20	15	15	20	19·6
$\frac{L}{W}$	3·83 — 4·6	4·2	4	4·4	4
$\frac{Rs}{R_{4+5}}$	0·9 — 2·5	1·17	1·04	1·08	1·25
$\frac{M}{M_{3+4}}$	0·341— 0·640	0·38	0·45	0·55	0·45
$\frac{CuA}{CuA_1}$	0·591— 0·890	1·04	0·92	1·05	0·69
Hindwing					
Length in mms.	14 —17·5	13	13·5	18	17
$\frac{\text{Length}}{1A}$	1·42 — 1·66	1·62	1·45	1·6	1·47
$\frac{1A}{\text{anal fan}}$	3·12 — 3·81	3·55	3·21	3·4	3·54
$\frac{Rs}{R_{4+5}}$	·88 — 2·86	2·4	1·43	2·0	2·1
$\frac{M}{M_{1+2}}$	·411— ·683	·31	·41	·36	·4
$\frac{M_{3+4} + CuA}{M_{3+4}}$	·250— ·793	·16	·67	·60	·23
$\frac{Rs + M_1}{M}$	·290— ·530	·5	·16	·39	·32

The indices underlined in the above table may have some significance but an examination of a long series would be necessary before any decision could be made and long series are not available at present.

Trinotoperla woodwardi sp.n. (Fig. 3)

Holotype female. Head. Deep brown, darker near ocelli and behind epicranial arms. Above the attachments of dorsal tentorial arms paler with dark margins. Maxillae yellowish brown with three apical segments of palps darkened. Labium very pale with only the apex

of palps darkened. Antennae almost black with pale areas on three basal segments; 58 segments (in paratypes from 58 to 62 segments).

Thorax. Brown with darker areas on the anterior lobes of the meso and meta scuta, centre of the mesoscutum, thoracic pleurites, and the lateral areas of the meso and meta-basisterna. Posterior margin of metabasisternum straight. *Legs.* Femora, tibiae and tarsi dark brown; the posterior face of the femora and the central portion of the middle and hind femora and tibiae slightly paler. Apices of antero-ventral femoral ridges with a distinct but blunt tooth. *Wings* (Fig. *b*). All cross-veins clouded pale greyish brown, more extensive and darker along costal margin. Central portion of large cells at base of wing also clouded greyish brown. Complete series of cross-veins between C and Sc, and C and R1. No cross-veins between 1A and 2A. Three branches of Rs and CuA. From 6 to 7 cross-veins in anal fan (paratypes varied from 7 to 13).

Abdomen. Pale purplish brown with darker areas at the antero-lateral corners of the sterna.

Terminalia. Tenth tergum darker with distinct blackish markings near the antero-lateral corners. Eighth and ninth sterna darker and the subgenital plate nearly black. Cerci dark, pale at base, with 26 segments (in paratypes with both cerci apparently complete the number of segments varied from 25 to 26). Paraprocts (Fig. 3 *c*) pointed, parallel or slightly incurved. Subgenital plate with posterior border slightly concave.

Male, teneral but agrees with female in colour pattern. Antennae 54-55 segments but slightly damaged.

Terminalia. Tenth tergite with a very short membranous process. Epiproct in side view narrow basally then expanding and the distal third produced into a long curved sharp spine. Paraprocts narrow basally expanded in middle and rather bluntly rounded apically. Subgenital plate rounded apically. Only tenth tergite and epiproct figured.

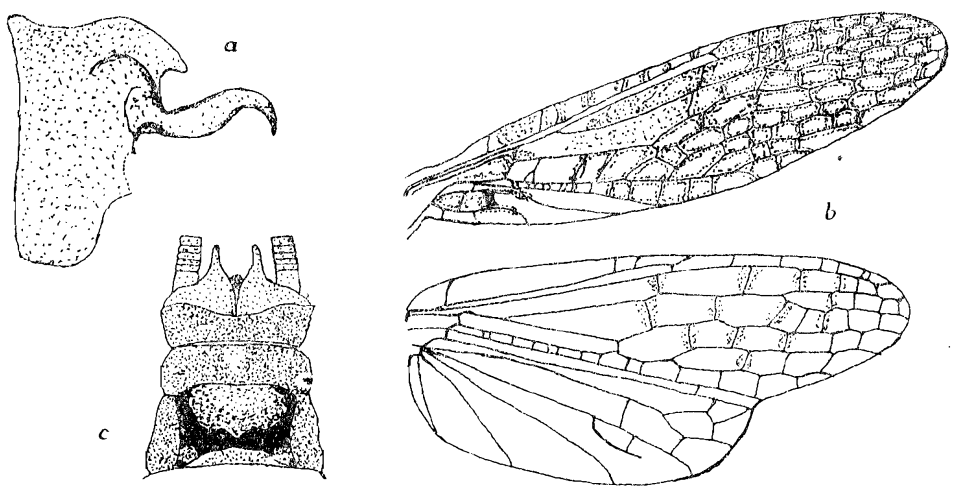

FIG. 3—*T. woodwardi* sp.n. *a* male terminalia fromside (cerci and paraprocts omitted); *b* right wings; *c* female terminalia (ventral view).

Measurements. Female, body, 19.3 mm.; forewing, 19.6 mm.; hindwing, 17.5 mm. Male, body 11 mm. (contracted); forewing, 18 mm.; hindwing 16 mm.

Localities: Queensland: *Lamington Nat. Park* (9 females, 30.v.1939; 8 females, 1-5.vi.1955, F. A. Perkins), (6 females, 2-6.v.1956; 2 females, 21.viii.1956, I. C. Yeo), (1 male, 26.xii.1954, T. E. Woodward), (1 female, xii.1925, L. Franzen).

Types. Holotype female (T 5672) and allotype male (T 5673) both from Lamington National Park, Queensland presented to Queensland Museum. Paratypes 15 females.

The species is named after my colleague Dr. T. E. Woodward, who has played a big part in building up our collection of Plecoptera.

Discussion. This species agrees with *irrorata* Tilly. and *nivata* Kim. in possessing a complete series of costal cross-veins. It differs from *irrorata* in having no pronounced lobe in the forewing and in the large number of cross-veins in anal fan, and from *nivata* in not having a series of cross-veins between 1A and 2A.

Trinotoperla mayi sp.n. (Fig. 4)

Holotype female. Head. Yellowish brown with the following brown markings:—sides of anterior portion of the frons extending to median ocellus, anterior portion of epicranium, lateral borders of the labrum. The pale ocellar triangle emphasised by the black pigmentation of the ocelli. Clypeus, base of labrum, palps and lobes of the labium much paler, almost white. Antennae brown with dark brown areas on first and second segments; with 55 segments in the right and 56 in the left.

Thorax typical of the genus. Posterior margin of the meta basisternum with a very distinct median V-shaped cleft. *Legs* with femora brown basally on anterior face, darker apically with a conspicuous fulvous longitudinal stripe in the middle; tibiae and tarsi much darker, antero-ventral ridge barely produced, certainly not a sharp tooth as in *groomi*. *Wings* with a distinct brownish tinge darker along costal margin and cross-veins. No series of cross-veins between C and Sc and between 1A and 2A and none in the anal fan. Other details as in Fig. 4 *a*.

Abdomen. Pale, almost white, except for yellowish brown area on the eighth and ninth segments and the dark pattern of the subgenital plate.

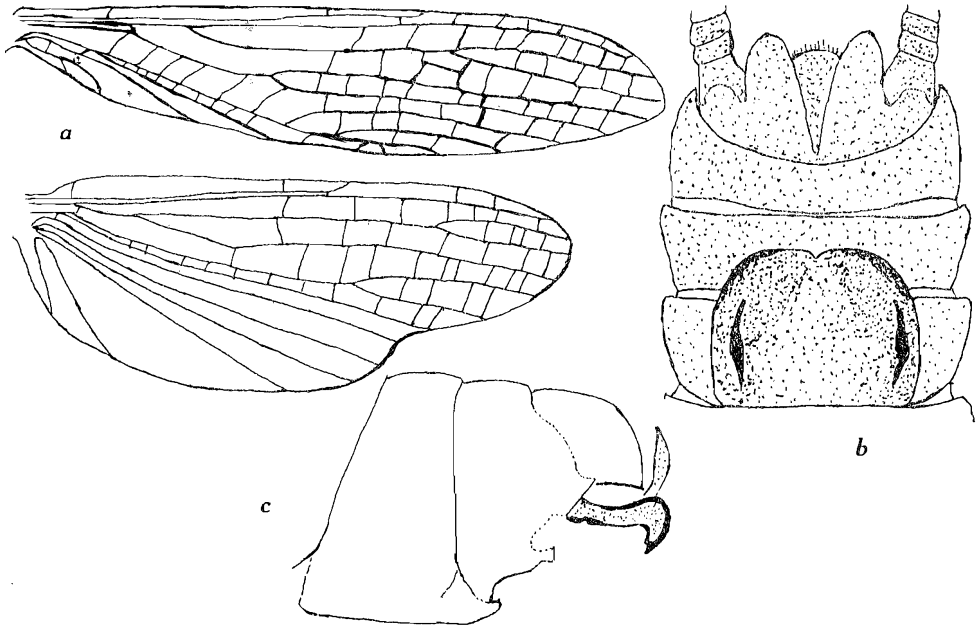

FIG. 4—*T. mayi* sp.n. *a* right wings; *b* female terminalia (ventral view); *c* male terminalia from side (cerci and left paraproct omitted).

Female terminalia as in Fig. 4 *b*. Posterior margin of the subgenital plate convex with a small but distinct median cleft. Paraprocts diverging and with bluntly rounded apices. *Cerci* black in colour except for under side of first five segments, with 16 segments.

Male allotype. Agrees with female except that tergites of abdomen have a purplish tinge. Antennae with 59 and 60 segments.

Male terminalia. Tenth tergite pale and triangular both in dorsal and lateral view. Epiproct in side view somewhat parallel sided for over three-quarters of its length, then produced into a very short blunt hook on the inner side of which is another smaller tooth. Paraprocts tapering and curving upwards to rather sharp apices. Subgenital plate short somewhat truncate apically. *Cerci* 16 and 18 segmented.

Measurements. Female, body, 17 mm.; forewing, 19 mm.; hindwing, 17 mm. Male, body, 13 mm. (somewhat contracted); forewing, 18 mm.; hindwing, 16 mm.

Localities: Queensland: *Lamington Nat. Park* (2 males 1 female, 2-6.v.1956, I. C. Yeo), (1 male 1 female, 30.vi.1942, I. E. Common), (1 female, 30.v.1935; 1 female, 24.v.1939; 1 female, 30.v.1939; 1 female, 1-5.vi.1955, F. A. Perkins). *Springbrook* (1 female, 24.xii.1929, L. Franzen). *Tamborine Mt.* (1 female, 10.xii. 1927, L. Franzen), (1 female, 7.x.1954, J. Peberdy). *Samford* (2 males 1 female, 28.ix.1930, L. Franzen). *Toowoomba* (2 females, 9.xi.1954, A. W. May). *Bunya Mtns.* (1 female, 30.ix.1954, A. W. May and J. L. Groom). *Cardwell* (1 female, 2.vi.1953, T. E. Woodward).

Types. Holotype female (T 5678) from Bunya Mtns. and allotype male (T 5679) from Lamington Nat. Park presented to Queensland Museum. Paratypes 3 males and 12 females.

Named after Mr. A. W. May of the Department of Agriculture and Stock, who has collected Plecoptera since his student days and who obtained some of the type series.

Discussion. This handsome species agrees with *australis* Tilly. and *franzeni* sp.n. in having diverging finger-like paraprocts in the female but differs from both in the peculiar epiproct of the male and the presence of cross-veins between C and R1.

Trinotoperla franzeni sp.n. (Fig 5)

Holotype female. *Head* yellowish with the following brown pattern:—a broad area on the epicranium behind the arms of, and adjacent to, the stem of the epicranial suture; the margins of the anterior part of the frons forming a rectangle whose centre is bright yellowish brown; ocellar triangle bright yellowish brown contrasting sharply with the black pigment of the ocelli. Apices of palps with a brownish tinge. Antennae very dark brown, basal segment only with pale areas, right with 49 and left 48 segments.

Thorax colour pattern typical of genus but a little paler than most species. Posterior margin of meta-basisternum with a distinct V-shaped median cleft. *Legs* with pale coxae and trochanters; femora brown with central portion paler. The apex of the antero-ventral femoral ridge blunt, not produced into a tooth. *Wings* with veins and cross-veins of forewing broadly clouded with pale purplish brown, with similar blotches occupying most of the central portion of the larger cells. Hindwings with only the costal cells somewhat clouded. Venation as in Fig. 5 *a*.

Abdomen pale, almost white, with purplish areas, and the posterior and lateral margins of the terga dark brown. Tenth tergite yellowish brown with a darker antero-median area. Eighth and ninth sternites yellowish with a small median brown blotch on the ninth.

Female terminalia. Tenth tergite with a short finger-like apical process. Paraprocts diverging with broadly rounded apices. Posterior margin of subgenital plate straight. Cerci with 14 segments and dark brown in colour.

Allotype male similar in colour and wing venation to female. Antennae with 47 and 43 segments.

Male terminalia. Subgenital plate broadly rounded, apex of tenth tergite from above short and triangular in shape, from the side as in Fig. 5 *b*. Epiproct short expanding distally, apex in form of a short blunt tooth, a small distinct dorsal tooth near base. Each paraproct narrow at base, expanding apically and terminating in a small apical tooth. Cerci with 13 segments.

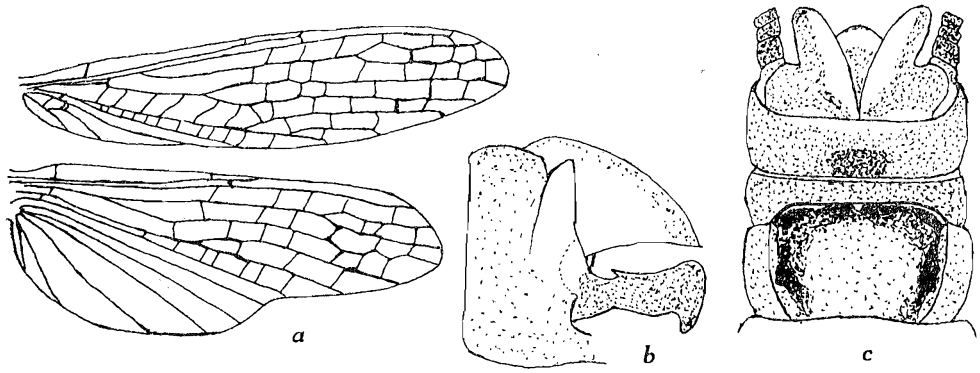

FIG. 5—*T. franzeni* sp.n. *a* right wings; *b* male terminalia (cerci and paraprocts omitted); *c* female terminalia (ventral view).

Measurements. Female, body, 10 mm.; forewing, 15 mm.; hindwing, 13 mm. Male, body, 9 mm.; forewing, 13 mm.; hindwing, 12 mm.

Localities: S.E. Queensland: *Canungra* (1 male, 28.iii.1957, G. L. Wilson). *Mt. Edwards* (1 female, 1.iii.1934, F. A. Perkins). *Brisbane* (1 female 1 male, 14-21.iv.1956, T. H. Kirkpatrick), (2 males 1 female, 27.vii.1930; 1 male 1 female, 30.viii.1930, 1 female, 20.iv.1929; 1 female, 14.viii.1929, L. Franzen), (1 female, 31.viii.1952, S. Barker). *Upper Brookfield* (1 male, 28.ix.1954, J. Peberdy), (1 female, 12.v.1956, H. Lavery), (1 female, 15.v.1956, T. H. Kirkpatrick), (4 males, 28.ix.1954. J. Peberdy and Y. Beri). *Highvale* (1 female, 25.viii.1955, I. C. Yeo). *Cedar Crk., Samford* (1 male, 30.ix.1954, J. Peberdy), (1 male 1 female, 30.iv.1930, L. Franzen), *Pine River* (1 male, 27.iii.1930; 1 female, 9.viii.1930, F. A. Perkins). *Tibrogargan Ck.* (1 male, 11.ix.1956, H. Lavery). *Toowoomba* (1 female, at light, 23.iii.1956, A. W. May), (1 male, 2.vi.1937, N. M. Yeates). *Mapleton* (1 male, 7.iv.1951, E. F. Henzel). *Bunya Mtns.* (2 males, 10.viii.1955, T. E. Woodward).

Types. Holotype female (T5674) from Toowoomba and allotype male (T 5675) from Upper Brookfield presented to Queensland Museum. Paratypes 8 males and 4 females.

Named in honour of the late Mr. L. Franzen, who was the first in Queensland to collect Plecoptera.

Discussion. This species is very close to *australis* Tilly. with which it agrees in wing venation and the shape of the paraprocts in the female. It differs in having no teeth on the apical ventral margin of the epiproct, but has a basal dorsal tooth in this structure, and in the shape of the subgenital plate in the female.

Trinotoperla yeoi sp.n. (Fig. 6)

Holotype female. Head. Colour pattern distinctive. Frons dark brown except for a circular pale area at the base of the epicranial fork; epicranium fulvous dark brown behind the arms of the epicranial suture and both sides of the stem. Antennae with 54 segments in left, 20 (incomplete) in right.

Thorax. Typical mottled brown with dark areas. Posterior margin of metabasisternum straight. *Legs* brown with conspicuous oval pale areas in the middle of the anterior face of the middle and hind femora. Antero-ventral ridge produced apically into a distinct but blunt tooth. *Wings* as in Fig. 6 *a*, costal cell with conspicuous brownish grey patches which can be mistaken for clouded veins, most veins and cross-veins with faint brownish clouding. Anal fan with only 1 or 2 cross-veins or none.

Female terminalia. Tenth tergite produced into a short pale triangular lobe. Paraprocts short, somewhat pointed and almost parallel. Subgenital plate with anterior border curved and basal margin sinuous, the only darker markings along the anterior border. Cerci 20 in left and 16 in right (incomplete).

Allotype male. Similar to female antennae with 55 segments.

Male terminalia. Apex of tenth tergite produced into a long process finger-like in side view. Epiproct slightly widened in the middle and only the apical fourth produced to form a blunt spine. Paraprocts very narrow in middle with rounded club-shaped apices. Cerci with 20 segments.

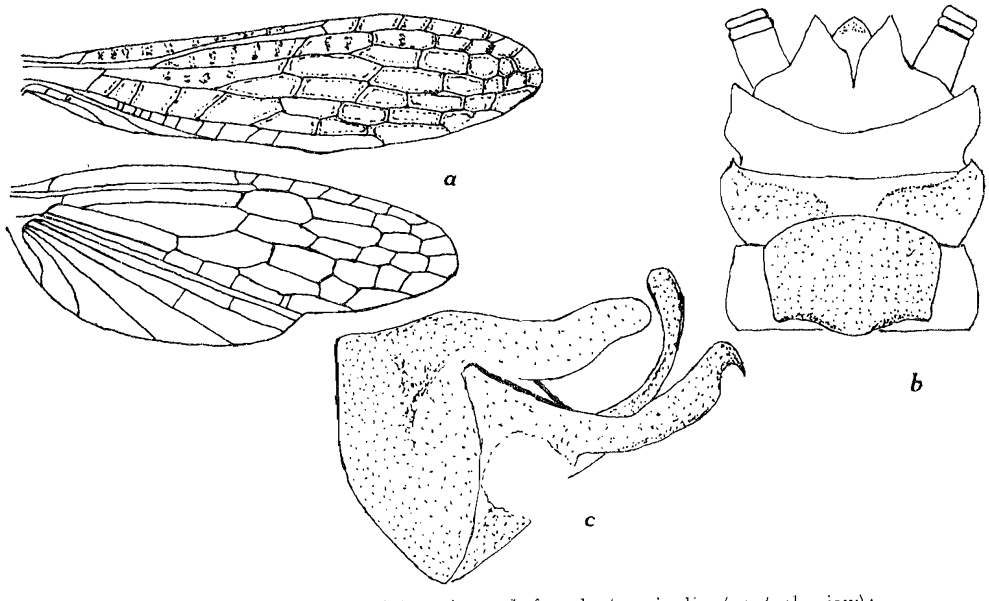

FIG. 6—*T. yeoi* sp.n. *a* right wings; *b* female terminalia (ventral view); *c* male terminalia (cerci and left paraproct omitted).

Measurement. Female, body, 10 mm.; forewing, 15 mm.; hindwing, 13.5 mm. Male, body, 11.5 mm.; forewing, 16.5 mm.; hindwing, 14.5 mm.

Localities: S.E. Queensland: *Lamington Nat. Park* (1 male 1 female, 7.vii.1955; 1 male, 4.v.1956; 1 female, 22.viii.1956, I. C. Yeo), (1 male, 1-5.vi.1955, F. A. Perkins).

Types. Holotype female (T5676) and allotype (T5677) male from Lamington National Park, presented to Queensland Museum. Paratypes 2 males and 1 female.

This species named after Mr. I. C. Yeo, who collected the type series in addition to valuable collections of other species.

Discussion. This species agrees with *mayi* and *hardyi* in having a series of pterostigmatic cross-veins but no cross-veins between C and Sc and between 1A and 2A. It differs from *mayi* in the shape of the epiproct in the male and paraproct in the female, absence of cleft in posterior margin of meta basisternum, and colour pattern of head; from *hardyi* in the shape of the sub-genital plate in the female, the shape of the epiproct, the barely developed blunt femoral tooth and colour pattern of the head.

Trinotoperla hardyi sp.n. (Fig. 7)

Holotype female. (Originally pinned and bristled, then removed from pin by soaking in hot water and mounted on a slide. Unfortunately, damaged to some extent during the process, but the more important features plainly visible).

Head. Very dark, much darker than other species of the genus, even the palps, labrum, and mentum being dark brown. Antennae dark brown with 49 segments in right and 48 in left.

Thorax very dark in colour, almost black. Posterior margin of meta-basisternum straight with no median cleft. *Legs* very dark, the femora and tibiae with broad pale basal bands. Apex of antero-ventral femoral ridge produced to form a rather long sharp tooth. *Wings* as in Fig. 7 *a*, the forewing darker due to the presence of numerous dark blotches in the cells. No complete series of cross-veins in costal cell and between 1A and 2A. Thickened cross-vein between 1A and 2A dark. No cross-veins in anal fan of hindwing.

Abdomen darkened, with the tergites and sternites of the 7th, 8th, 9th and 10th segments very dark.

Female terminalia as in Fig. 7 *b*. Apical margin of tenth tergite rounded. Paraprocts broad at base pointed apically and sub-parallel. Subgenital plate very distinctive, the posterior margin deeply cleft in the middle, the cleft being formed between two convex rounded lobes. Cerci damaged.

Allotype male (removed from pin and preserved in alcohol and glycerine).

Head, thorax and *abdomen* similar to female. Right antenna with 52 segments, left incomplete.

Male terminalia as in Figs. 7 *c, d*. Apex of tenth tergite produced into a long narrow lobe with rounded apex. Epiproct rather slender in side view, about the apical fifth only being produced to form a short somewhat vertical sharp tooth; dorsally near the base are two small black teeth. Paraprocts rather long, broad at the base, curving upward and then inwards, and with pointed apices. Subgenital plate dark, short and truncate. Cerci dark with 17 segments.

Measurements. Female, body indeterminate; forewing, 15 mm.; hindwing, 13 mm. Male, body, 13 mm.; forewing, 12 mm.; hindwing, 11 mm.

Locality: Tasmania: *Strahan* (3 males and 3 females, ii.1924, G. H. Hardy).

Types. Holotype female (T5680) and allotype male (T5681) from Strahan, Tasmania, presented to Queensland Museum. Paratypes 2 males and 2 females. Named after Mr. G. H. Hardy, who collected the type series.

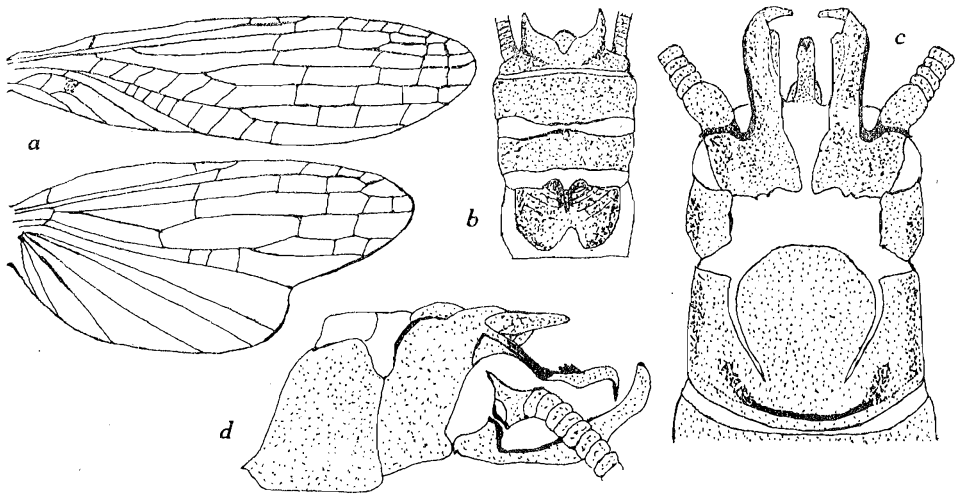

FIG. 7—*T. hardyi* sp.n. *a* right wings; *b* female terminalia (ventral view); *c* male terminalia (ventral view); *d* male terminalia from side (right cercus and paraproct omitted).

Discussion. This species is very different from the Australian, with the possible exception of *yeoi*, from which it differs in the shape of the subgenital plate in the female and the epiproct in the male.

Trinotoperla nivata Kimmins (Fig. 8)

Trinotoperla nivata Kimmins 1951. *Bull. Brit. Mus.* (*Nat. Hist.*) *Ent.* **2** (2): 78. Figs. 27, 28.

The male of this species has not been described as Kimmins had only the holotype female in the collections studied by him. Two specimens, which agree with the published description of the female very closely, appear to be males of this species and are hereby described.

Hypotype male. Head. Colour pattern of head as in female with the areas above dorsal tentorial arms paler and margined with dark brown. Right antenna with 52 and left with 51 segments.

Thorax. Posterior margin of meta basisternum straight, not cleft. *Wings* 2-3 cross-veins in distal part of anal fan, otherwise as figured by Kimmins.

Male terminalia as in Fig. 8 *a*, *b*. Tenth tergite from above with a very short pointed apex; and the basal arms of the supraanal lobe very dark and clearly defined. Epiproct in side view broad at the base, suddenly contracting beyond the middle and then produced into a long curved spine; the central portion blackish in colour. Paraprocts with apices bluntly rounded and a dark outer edge. Subgenital plate prominent, rather long and rounded apically. Cerci with 19 segments.

Measurements. Body, 12.5 mm.; forewing, 16 mm.; hindwing, 14.5 mm.

Hypotype male (T 5682) from Kiandra, N.S.W., presented to Queensland Museum.

Localities: New South Wales: *Kiandra* (1 male, 8.i.1955, T. E. Woodward). Victoria: *Warburton* (1 male, 11.ii.1957, F. A. Perkins).

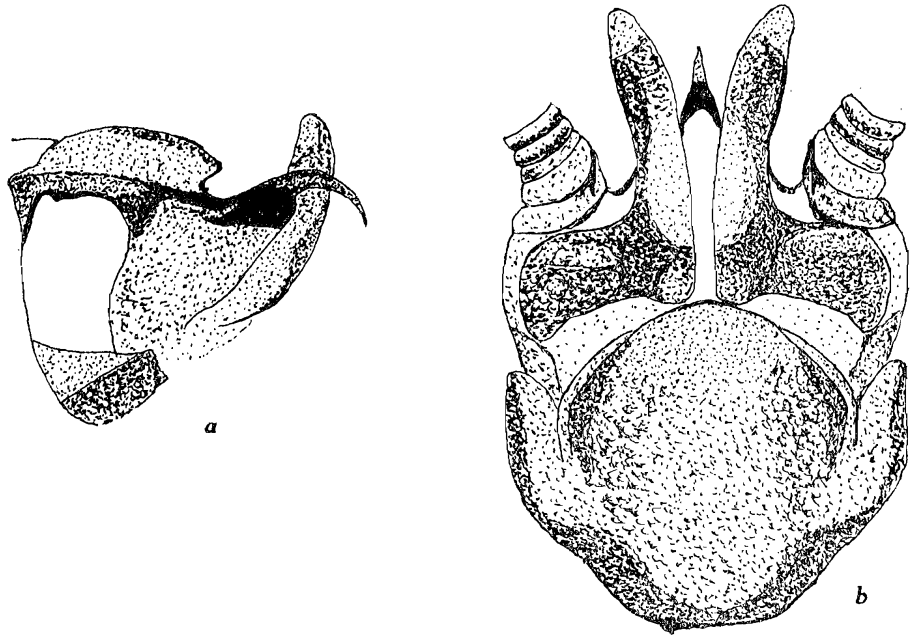

FIG. 8—*T. nivata* Kim. *a* male terminalia from side (cerci and left paraproct omitted); *b* male terminalia (ventral view).

Discussion. This is the only species of the genus so far described with complete series of cross-veins between C and Sc; C and R1; and 1A and 2A.

Trinotoperla minor Kimmins

Trinotoperla minor Kimmins, 1951. *Bull. Brit. Mus.* (*Nat. Hist.*) *Ent.* **2** (2): 78. Fig. 29.

A male from McKenzie Falls, Victoria, collected on 6.ii.1957, agrees almost completely with Kimmins's description of this species. It differs in having no cross-veins in the anal fan whereas his figure showed one cross-vein. It seems desirable to record the colour pattern of the head which in other species is distinctive and constant specifically. The top of the head is dark brown except for a small pale circular spot below the median ocellus and the stem of the epicranial suture. The areas above the attachments of the dorsal tentorial arms distinctly darker than the rest of the frons. The number of antennal segments, not mentioned in original description, is 50 for right antenna and 51 for left.

The posterior margin of the meta-basisternum is straight having no V-shaped median cleft.

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