

**NEW SPECIES OF AUSTRALIAN LESTIDAE (ODONATA)**

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**Abstract**

Three new species of Australian Lestidae, *Austrolestes aleison*, *Austrolestes minjerriba*, and *Indolestes obiri*, are described, and the adults of the 14 known species of Australian lestids are keyed. Lectotypes are designated for *Lestes psyche* Hagen in Selys and *Lestes leda* Selys. *Austrolestes albicauda tindalei* Tillyard is newly placed in synonymy with *Indolestes alleni* (Tillyard).

**Introduction**

In the most recent extensive account of the Australian lestid damselflies, Fraser (1960) included 11 species in two genera, *Lestes* Leach (Lestinae) and *Austrolestes* Tillyard (Sympecmatinae, given family status by Fraser): *Lestes concinnus* Hagen in Selys, *Austrolestes alleni* Tillyard, *A. analis* (Rambur), *A. annulosus* (Selys), *A. aridus* (Tillyard), *A. cingulatus* (Burmeister), *A. insularis* Tillyard, *A. io* (Selys), *A. leda* (Selys), *A. psyche* (Hagen in Selys), and *A. tenuissimus* (Tillyard). Watson (1974, 1977), following Lieftinck (1960), placed *alleni* and *tenuissimus* in *Indolestes* Fraser, and mentioned three further undescribed species, *Austrolestes* sp. "a" from south-western Australia, *Austrolestes* sp. "m" from dune-lakes in southern Queensland and northern New South Wales, and *Indolestes* sp. "o" from Arnhem Land.

We describe these three new species below, and key the adults of the 14 known Australian species of Lestidae. The descriptions of species, the designation of lectotypes, and the synonymies are the responsibility of Watson, except for the description of *Austrolestes aleison* sp. n., of which the authors are Watson and Moulds. The two new *Austrolestes* are closely allied to *A. psyche*—indeed, *A. aleison* was earlier identified as *A. psyche*—and form a group that we have elected to treat together. The terminology in the descriptions is that of Chao (1953). Unless indicated otherwise, material is lodged in the Australian National Insect Collection, CSIRO, Canberra; paratypes will be distributed later. Abbreviations for other collections are: BMNH, British Museum (Natural History), London; MCZ, Museum of Comparative Zoology, Harvard; SAM, South Australian Museum, Adelaide; UNE, University of New England, Armidale; UQ, University of Queensland, Brisbane.

**Key to species of Australian Lestidae**

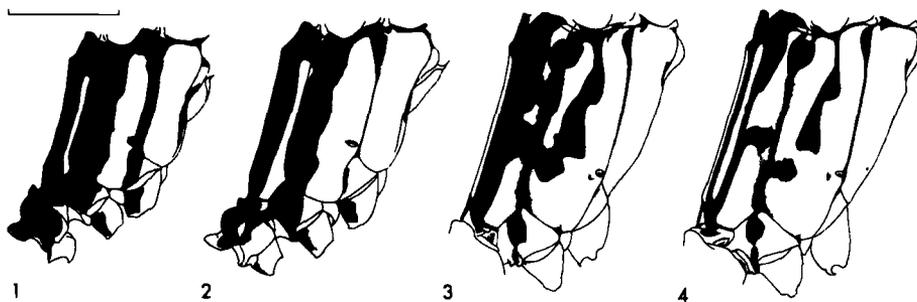
1. Quadrilateral cells of fore and hind wing similar in size and shape, that of hind wing less than 1.10 times length of fore wing quadrilateral . . . . . **Lestes concinnus** (Burmeister)
- Quadrilateral cell of hind wing more than 1.15 times, usually 1.3-1.5 times, longer than that of fore wing . . . . . 2
2. Front of synthorax marked with vertical metallic green stripe on each side, expanded laterally near centre to form brownish or green spot; Ac approximately midway between Ax<sub>1</sub> and Ax<sub>2</sub> in fore wing, often nearer to Ax<sub>2</sub> . . . . . **Indolestes** Fraser 3
- Front of synthorax unicolorous or striped, the stripe not expanded at centre; Ac generally near Ax<sub>1</sub>, basal or distal, occasionally almost midway between Ax<sub>1</sub> and Ax<sub>2</sub> . . . . . **Austrolestes** Tillyard 5
3. Hind wing of male less than 20 mm long, of female less than 21 mm . . . . . **I. alleni** (Tillyard)
- Hind wing of male 20 mm or more long, of female 21 mm or more . . . . . 4
4. Abdominal tergites 3-6 marked with pale basal ring, blue in mature male, ill-defined in mature female; metapleural suture marked brown only at upper end; superior appendages of male sinuate, reflexed and broadly contiguous at tips . . . . . **I. tenuissimus** (Tillyard)
- Abdominal tergites 3-6 with pale basal ring and subapical band, whitish in mature specimens; metapleural suture narrowly marked dark brown; superior appendages convergent at tips, forcipate . . . . . **I. obiri** sp. n.

5. Pterostigma overlying crossveins of adjoining row only near each end; Ac far beyond level of Ax<sub>1</sub>, generally about midway between Ax<sub>1</sub> and Ax<sub>2</sub>; metapleural suture not marked with pigmented stripe; abdominal tergite 2 marked with dark longitudinal stripe on each side of pale midline, or with ill-defined marks on pale background . . . . . **A. insularis** Tillyard  
 Central part of pterostigma overlying one or more crossveins of adjoining row; Ac closer to level of Ax<sub>1</sub> than of Ax<sub>2</sub>, sometimes basal to Ax<sub>1</sub>; metapleural suture variable; abdominal tergite 2 with well-defined light and dark pattern, or substantially dark . . . . . 6
6. Pale humeral stripe broad, its upper end crossing mesopleural suture onto mesepimeron and subalar ridge almost to segmental junction . . . . . 7  
 Pale humeral stripe narrow, with at most a small upper patch extending across mesopleural suture, not meeting subalar ridge . . . . . 8
7. Metapleural suture narrowly lined black from subalar ridge to spiracle; abdominal segments 9-10 of male pale above . . . . . **A. aridus** (Tillyard)  
 Upper quarter to third of upper metapleural suture marked black; abdominal segment 10 of male pale above . . . . . **A. analis** (Rambur)
8. Humeral stripe extending across mesopleural suture . . . . . 9  
 Humeral stripe not extending across mesopleural suture . . . . . 11
9. Abdominal segment 10 of male black; basal pale ring of abdominal tergite 7 of female broad, occupying approximately 20% of length of segment . . . . . **A. minjerriba** sp. n.  
 Abdominal segment 10 of male pale above; basal pale ring of abdominal tergite 7 of female narrow, occupying approximately 10% of length of segment . . . . . 10
10. Median lobe of pronotum with pale lateral margin; abdominal tergite 2 of male dark above, with pale, narrow middorsal line over distal third . . . . . **A. io** (Selys)  
 Median lobe of pronotum dark laterally; abdominal tergite 2 of male marked with dark longitudinal stripe on each side of broad, pale midline . . . . . **A. leda** (Selys)
11. Abdominal tergite 2 dark distally, with basal pale semicircular, triangular or pointed half-oval spot; superior appendages of male sinuate, reflexed and broadly contiguous at tips . . . . . **A. cingulatus** (Burmeister)  
 Abdominal tergite 2 without pale basal spot; superior appendages of male forcipate, converging at tips . . . . . 12
12. Ac proximal to Ax<sub>1</sub> in fore wing; abdominal tergites 3-7 of male substantially pale, with forward-pointing, dark arrow-shaped mark on posterior half . . . . . **A. annulosus** (Selys)  
 Ac distal to Ax<sub>1</sub> in fore wing; abdominal tergites 3-7 of male substantially dark, with pale basal rings . . . . . 13
13. Pale ring at base of abdominal tergite 7 occupying approximately 20% of length of segment . . . . . **A. minjerriba** sp. n.  
 Pale ring at base of abdominal tergite 7 occupying approximately 10% of length of segment, or less . . . . . 14
14. South-eastern Australian; abdominal tergite 2 of male with dorsal dark mark, slightly constricted at centre . . . . . **A. psyche** (Hagen in Selys)  
 South-western Australian; dorsal mark on abdominal tergite 2 of male strongly constricted at centre, forming narrow stem . . . . . **A. aleison** sp. n.

### **Austrolestes psyche** group

**Austrolestes aleison**\* Watson and Moulds sp. n. (Figs 5, 6, 12, 19-21)

\*αλεισον, a goblet, referring to the goblet-shaped mark on abdominal segment 2 of the male.



FIGS 1-4—Thoracic patterns of lepidoptera: (1) *Austrolestes psyche*, lateral view; (2) *Austrolestes minjerriba*, lateral view; (3) *Indolestes obiri*, ♂, darkest specimen, slightly anterolateral view; (4) *I. obiri*, ♀, slightly anterolateral view. Scale = 2 mm.

*Lestes psyche* Selys; Tillyard, 1908: 738.

*Lestes psyche* (Hagen); Ris, 1910: 423, 427 (*partim*).

*Austrolestes psyche* Selys/Hagen et Selys; Tillyard, 1913: 425, 473 (*partim*).

*Austrolestes psyche* (Hagen); Watson, 1958: 143.

*Austrolestes psyche* (Selys); Fraser, 1960: 9, 24 (*partim*).

*Lestes* (*Austrolestes*) *psyche* (Selys); Lieftinck, 1960: 139 (*partim*).

*Austrolestes psyche* (Hagen); Watson, 1962: 12, 18, Figs 13, 17, 80, 91, 114.

*Austrolestes* sp. "a"; Watson, 1974: 142.

*Types*.—*Holotype* ♂, *allotype* ♀: S.W. AUSTRALIA: "Myalup Swamp" (= Lake Josephine), W of Harvey, 29.xii.1955, J. A. L. Watson (ANIC Type No. 9864) (in ANIC). *Paratypes*: WESTERN AUSTRALIA: one ♀, Bindoon, 18.iv.1954, E. P. Hodgkin; one ♂, Gnangara, 7.x.1954, E. P. Hodgkin; one ♂, Abbett Park Swamp, Scarborough, i.1957, J. A. L. Watson; one ♂, Perth, i.1907, R. J. Tillyard; one ♀, Welshpool, 9.x.1957, J. A. L. Watson; three ♀♀, Lesmurdie, clay pit, 2.ix.1957, J. A. L. Watson; one ♂, Karragullen, 12.xii.1976, J. A. L. Watson; one ♂, Kelmscott, 15.ix.1957, J. A. L. Watson; one ♂, one ♀, Mandurah road 28 miles (45 km) S of Fremantle, 13.viii.1957, J. A. L. Watson; one ♂, 38 miles (61 km) E of Harvey, 16.xi.1957, J. A. L. Watson; six ♂♂, two ♀♀, "Myalup Swamp" (= Lake Josephine), W of Harvey, 28-29.xii.1955, J. A. L. Watson; one ♂, same locality, 15.xi.1958, J. A. L. Watson; two ♂♂, Jacky Jacky Spring, Dalyup River, 3.iv.1958, J. A. L. Watson; one ♂, Shark Lake, 8 miles (13 km) N of Esperance, 2.iv.1958, J. A. L. Watson; four ♂♂, one ♀, Margaret River, i.1907, R. J. Tillyard; five ♂♂, three ♀♀, Moingup Pool, Stirling Range, 27.ii.1956, J. A. L. Watson; one ♂, Cheyne Beach Swamp, 14.xii.1959, D. H. Edward.

### Male

Colour pattern closely similar to that of *Austrolestes psyche*, light blue and black in mature male, yellowish brown and black in teneralis.

*Head*.—Labium pale yellow; labrum light blue, variably edged black; anteclypeus bright blue; postclypeus, frons, vertex, occiput and antennae black with metallic green sheen, pale spot below each lateral ocellus; back of head black; genae light blue; mandibles bluish.

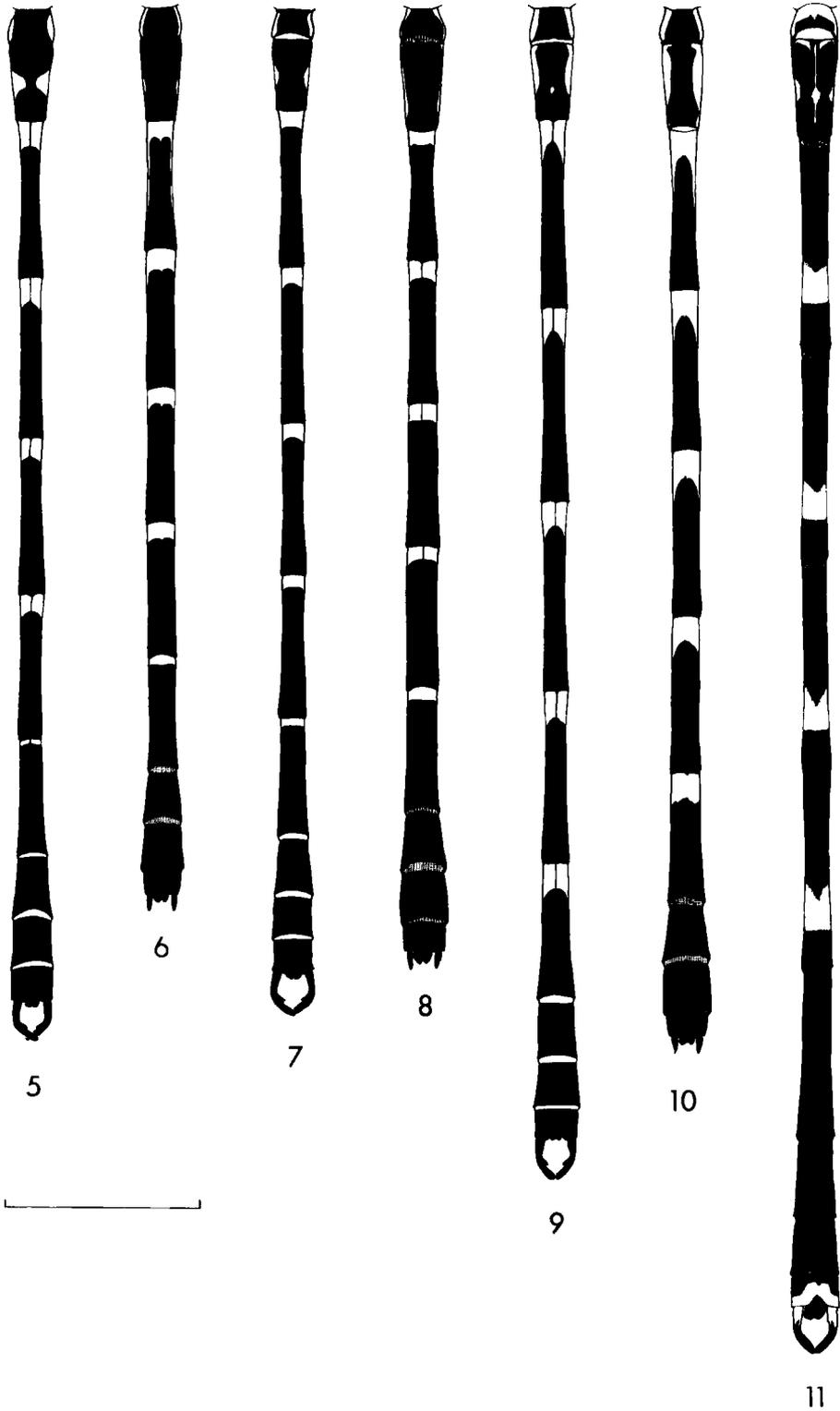
*Thorax* (*cf.* Fig. 1).—Pronotum black, with metallic green sheen; median lobe sometimes marked pale blue on lower margin, above pleura; proepimeron with pale yellow lower border.

*Synthorax* black in front, with metallic greenish sheen; bright blue antehumeral stripe extending upwards from lower margin of mesanepisternum approximately three-quarters length of upper pleural suture, not crossing it; mesepimeron and much of mesokatepisternum black; metapleura substantially light blue, yellowish behind and below, with narrow black stripe along metapleural suture and anterior katepisternum, black subalar ridge, and small blackish spot on each side of yellowish poststernum; sterna pale yellowish.

Procoxa and trochanter yellow; meso- and metacoxa yellowish, marked blackish in front; meso- and metatrochanter, all femora and tibiae mainly yellowish on upper surfaces, black below; tarsi and claws black.

*Wings* (Watson 1962, Fig. 80).—Average length of hind wing 15.80 mm (range 14.9-17.4 mm, N = 10); hyaline, veins black; pterostigma dark brown, costal length of fore wing pterostigma averaging 1.236 mm (range 1.14-1.34 mm), breadth averaging 0.352 mm (range 0.30-0.38 mm) (N = 10).

*Abdomen* (Figs 5, 12).—Tergites black with metallic bluish or greenish sheen, marked light blue; tergite 1 blue at side, the anterior margin dark brown, extended into brown to blackish spot behind acrotergite; intersegmental membrane 1-2 light blue; tergite 2 extensively blue at sides, the blue marks approaching midline near centre of segment, forming a black, goblet-shaped mark (Fig. 12); tergites 3-6 with basal blue mark occupying a seventh to a tenth of length of segment, often divided by narrow black middorsal line,



FIGS 5-11—Dorsal view of abdomens of lepidids: (5) *Austrolestes aleison*, ♂; (6) *A. aleison*, ♀ allotype; (7) *Austrolestes psyche* ♂; (8) *A. psyche* ♀; (9) *Austrolestes minjerriba*, ♂; (10) *A. minjerriba*, ♀; (11) *Indolestes obiri*, ♂. Scale = 5 mm.

expanded along lower margin, tending to yellowish, reaching or almost reaching end of tergite; tergite 7 with narrow blue basal ring, often narrowly divided in midline, narrowly expanded below into yellowish stripe along ventral carina; intersegmental membrane 7-8 marked with blue; tergites 8-10 without blue markings, tergite 8 narrowly yellowish along anterior part of ventral carina, the intersegmental membranes blue; sternites and ventral part of segment 10 dull yellowish brown, darkest on segment 9.

*Anal appendages* (Figs 19-21).—Superior appendages blackish, average length 1.118 mm (range 1.07-1.16 mm,  $N = 10$ ); subapical spine sharp, its anterior margin slightly concave, continuing basal curvature of appendage; ventrobasal knob close to base of appendage,  $0.76-0.81 \times$  appendage length from tip,  $0.42-0.49 \times$  appendage length from point of subapical spine; inferior appendages pale brownish green, variably darkened laterally, their apices slightly concave.

### Female

Size marginally greater than male; length of hind wing averaging 16.54 mm (range 15.1-18.0 mm), fore wing pterostigma averaging 1.394 mm (range 1.24-1.66 mm)  $\times$  0.384 mm (range 0.36-0.42 mm) ( $N = 10$ ), but abdomen shorter than in male (Fig. 6).

Colour pattern of head and thorax as in male. Abdomen with less extensive, duller blue markings, the metallic sheen duller, greener (Fig. 6); tergite 2 substantially black above, with restricted lateral blue mark; basal blue mark on tergite 3 occupying approximately a ninth of length of segment; marks on tergites 4-7 much as in male; intersegmental membranes 1-2, 7-10 dull grey.

### Distribution and habitat

The distribution and habitat of *A. aleison* were summarised by Watson (1962), under *A. psyche*.

### *Austrolestes minjerriba*\* Watson sp. n. (Figs 2, 9, 10, 15-18, 25-27)

*Austrolestes* sp. "m"; Watson, 1977: 277.

*Types*.—*Holotype* ♂, QUEENSLAND: North Stradbroke Island, Brown Lake, 3.i.1976, J. A. L. Watson and A. H. Arthington (ANIC Type No. 9876) (in ANIC). *Paratypes*: QUEENSLAND: two ♂♂, Fraser Island, Lake Minker, 21.xii.1975, H. Burton; two ♂♂, Moreton Island, swamp east of Blue Lagoon, 18.xii.1975, A. H. Arthington; seven ♂♂, North Stradbroke Island, perched swamp above Flinders Beach, 7.i.1976, J. A. L. Watson and A. H. Arthington; two ♂♂, one ♀, North Stradbroke Island, Brown Lake, 3-5.i.1976, J. A. L. Watson and A. H. Arthington; one ♀, same locality, 23.iii.1966, D. P. Heenan (UQ); one ♀, same locality, 9.iii.1974, D. Smith (UQ); three ♂♂, one ♀, North Stradbroke Island, Dunwich, 3-4.iv.1971, R. O. O'Shea, B. Reville, R. Coles and A. Saul (UQ); 10 ♂♂, two ♀♀, North Stradbroke Island, Tortoise Lagoon, 2.i.1976, J. A. L. Watson and A. H. Arthington. NEW SOUTH WALES: one ♂, Lake Hiawatha, Woolli, 13.iii.1976, A. F. O'Farrell and P. Brookhouse.

### Male

Colour pattern much as in *Austrolestes psyche*, light blue and black, sometimes partly obscured by whitish pruinescence in mature individuals, yellowish brown and blackish in teneralis.

*Head*.—Labium yellowish; labrum light blue, edged black; anteclypeus blue; postclypeus, frons, vertex and occiput black; blue spot below each lateral ocellus; antennae black; genae pale blue above, yellowish below; mandibles bluish; back of head black.

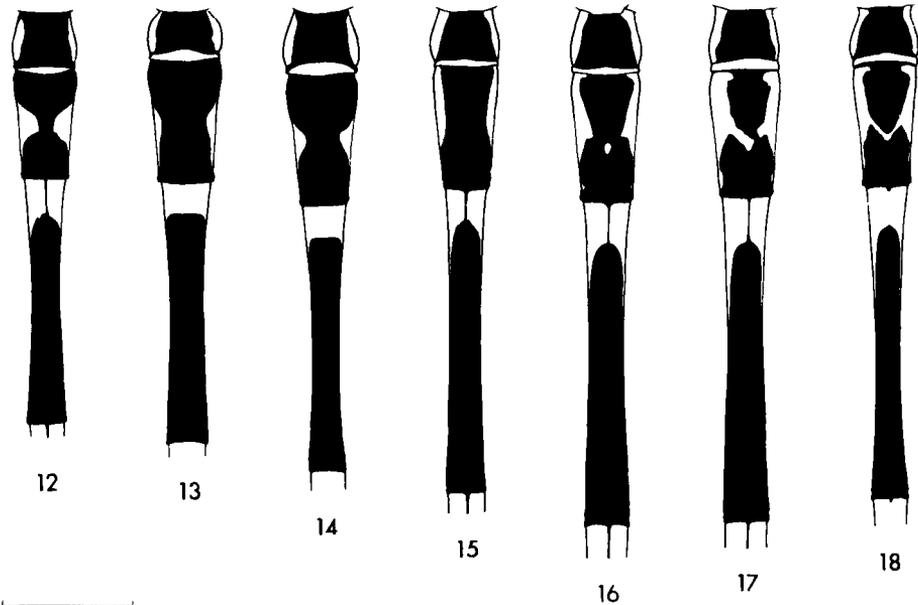
*Prothorax* (Fig. 2).—Centre half of anterior lobe of pronotum and margin light blue, lateral corners and posterior central spot black; median lobe largely black, with variable, triangular to squarish blue spot, commonly divided by black middorsal line, on posterior half, and variable blue stripe or spot on lower margin above epimeron, sometimes much reduced; posterior lobe black; upper quarter to third of pleura black, lower parts blue. Coxa and trochanter yellowish; outer surface of femur black, basal part to all of inner surface yellowish; outer ridge of tibia yellowish brown, rest of tibia black; tarsi black.

*Synthorax* (Fig. 2).—Front black, with slight greenish sheen; bright blue antehumeral stripe extending from mesostigmatic lamina along approximately 80% of length of upper mesopleural suture, often narrowly crossing it at upper end (Fig. 2); anterior third of mesokatepisternum and much of mesepimeron black; metapleura blue, yellowish below and behind, with narrow inverted triangular mark in upper third of upper metapleural suture, black subalar ridge, dark shadowing on anterior edge of katepisternum and black spot on either side of yellowish poststernum; sterna yellowish.

Anterior halves of outer surfaces of coxae blackish, posterior halves yellowish; trochanters yellow above, spotted black below; femora black on spinose inner surfaces, yellow outside; outer ridge of tibiae yellowish brown, rest of tibiae black; tarsi black.

*Wing* dimensions apparently varying with locality (Table); overall range of hind wing length 17.3-20.0 mm ( $N = 14$ ), of fore wing pterostigma  $1.34-1.67 \times 0.36-0.47$  mm ( $N = 14$ ); membrane hyaline, veins black; pterostigma dark brown.

\**minjerriba*, the Aboriginal name for North Stradbroke Island, where the species was first discovered; to be treated as an indeclinable noun.



Figs 12-18—Abdominal tergites 1-3 of male lepidoptera, dorsal view of: (12) *Austrolestes aleison*, holotype; (13) *Austrolestes psyche*, lectotype; (14) *A. psyche*; (15-18) *Austrolestes minjerriba* sp. n. (16 is holotype). Scale = 2 mm.

**Abdomen** (Figs 9, 15-18).—Tergites black with green or bluish sheen, marked with light blue; tergite 1 black above, blue at side, with brown to black trapezium shaped mark extending approximately half of length of segment from upper acrotergite parallel to ventral carina; intersegmental membrane 1-2 light blue; tergite 2 blue with brownish to black rim to genital fossa and variable, dorsal black band narrowest in centre of segment, narrower but generally similar to corresponding mark in *A. psyche* (cf. Figs 7, 13, 15), often marked with small middorsal blue spot two-thirds of tergite length from base (Fig. 16), or partly or completely divided by blue, V-shaped band (Figs 17, 18); intersegmental membrane 2-3 black; tergites 3-7 with basal blue band occupying, in the midline, a fifth to an eighth of length of segment, relatively wider on tergites 6-7 than on preceding segments, sometimes divided by fine middorsal black line, and expanded along lower part of tergite, terminating in yellowish spot in front of apical black band; intersegmental membranes 7-10 blue; tergite 8 black with or without small, yellowish anterolateral spot; tergites 9-10 black; sternites dark brownish to almost black, darkest in posterior segments.

**Anal appendages** (Figs 25-27).—Superior appendages black above, inner subterminal surfaces brown; length variable, overall range 1.17-1.31 mm (N = 14) (Table); subapical tooth protuberant, its anterior margin sinuate viewed from above, the tip directed more backwards than transversely; ventrobasal knob almost a third of appendage length from base,  $0.69-0.74 \times$  appendage length from apex,  $0.40-0.43 \times$  appendage length from tip of subapical spine; inferior appendages pale brownish, variably darkened, their apices strongly concave.

### Female

Dimensions apparently slightly larger than those of male; length of hind wing averaging 19.53 mm (range 18.0-21.1 mm); fore wing pterostigma averaging 1.653 mm (range 1.50-1.74 mm)  $\times$  0.463 mm (range 0.40-0.52 mm) (N = 6).

TABLE  
MEASUREMENTS OF MALE *AUSTROLESTES MINJERRIBA* (mm)

Dimensions	Locality				Wooli Lakes (N = 1)
	Fraser Is. (N = 2) range	Moreton Is. (N = 2) range	N. Stradbroke Is. (N = 10) $\bar{x}$	range	
Hind wing, length	17.3-18.3	18.0-18.3	18.87	18.2-20.0	17.5
Fore wing pterostigma, length	1.41	1.49-1.59	1.555	1.42-1.67	1.34
Fore wing pterostigma, width	0.36-0.39	0.41-0.42	0.446	0.44-0.47	0.46
Superior appendages, length	1.17	1.19-1.20	1.234	1.20-1.31	1.18

**Head.**—Colour pattern as in male, the pale markings duller, brownish; outer upper parts of scape and pedicel pale.

**Prothorax.**—Pronotum much as in male, the pale brownish to blue markings variable, generally more extensive; much of anterior lobe often pale; middorsal pale stripe on median lobe broadening towards posterior lobe, often extending across it, as does variably broad pale band on lateral margin, above epimeron, often leaving isolated black spot on each side of posterior lobe; pleura substantially pale, the epimeron darkened or slightly so above; legs as in male.

**Synthorax** pattern as in male; dorsal carina and outer part of antealar ridge pale; antehumeral stripe sometimes forked, narrowly extending onto katapisternum along lower part of mesopleural suture; legs as in male.

**Abdomen** (Fig. 10) shorter than in male, the pattern similar, the blue duller, intersegmental membranes 1-2, 7-10 grey; dorsal mark on tergite 2 similar to that of male illustrated in Fig. 15, lacking blue dorsal spot or V-shaped band.

### *Distribution and habitat*

The distribution and habitat of *A. minjerriba* strikingly parallel those of the libellulid *Orthetrum boumiera* Watson and Arthington; both appear to be confined to dune lakes in south-eastern Queensland and north-eastern New South Wales (Watson and Arthington 1978). *O. boumiera* has been recorded from Fraser, Moreton and North Stradbroke Islands, and from the Wooli Lakes, east of Grafton in New South Wales. *A. minjerriba* is also known from all these localities, and fragmentary material of an *Austrolestes*, collected from the Cooloola lakes system by J. N. Yates, almost certainly belongs to *A. minjerriba*. There are minor differences between the distributions of *O. boumiera* and *A. minjerriba* on North Stradbroke Island; *A. minjerriba* has been taken from a boggy, perched swamp at the northern end of the island, a swamp from which *O. boumiera* appears to be absent. On the other hand, neither has been found on any of the stream habitats on North Stradbroke, nor on Blue Lake (Lake Karboora), or any of the more open ponds such as those behind Flinders Beach, or the 18-Mile Swamp (Watson and Arthington 1978, and unpublished report). The factors that restrict the two species to the dune-lakes are not understood (Watson and Arthington 1978).

### *Austrolestes psyche* (Hagen in Selys) (Figs 1, 7, 8, 13, 14, 22-24)

*Lestes psyche* Hagen; Selys, 1862: 45.

*Lestes psyche* Selys; Tillyard, 1908: 738 (*partim*).

*Lestes psyche* (Hagen); Ris, 1910: 423, 427 (*partim*).

*Austrolestes psyche* Selys/Hagen et Selys; Tillyard, 1913: 425, 473 (*partim*).

*Austrolestes psyche* (Selys); Fraser, 1960: 9 (*partim*), 24 (*partim*), Plate 8(5), Plate 9(s).

*Lestes (Austrolestes) psyche* (Selys); Lieftinck, 1960: 139 (*partim*).

*Austrolestes psyche* (Selys); Watson, 1974: 142.

**Types.**—*Austrolestes psyche* was described from specimens of both sexes, in the Hagen and Selys collections (Selys 1862); Selys attributed authorship to Hagen. Inquiry of MCZ indicated that four supposed types of *psyche* were preserved in the Hagen collection there, and resulted in the transfer of the four to ANIC.

The four specimens include two species, one ♂ and one ♀ of the species described by Hagen as *psyche*, and two ♂♂ of the species described by Selys (1862, p. 47) as *Lestes leda*. The labelling is as follows:

1. "Type 12137" (red, MCZ label); "Hagen." (white, printed); "Nord Ost. . . v. Australi. . ." [white, handwritten and difficult to interpret; probably Hagen's hand (Fig. 28)]; "L. Psyche \* Hag." [white, handwritten by Hagen (Fig. 29)]. Male specimen of *Austrolestes leda*, lacking head.

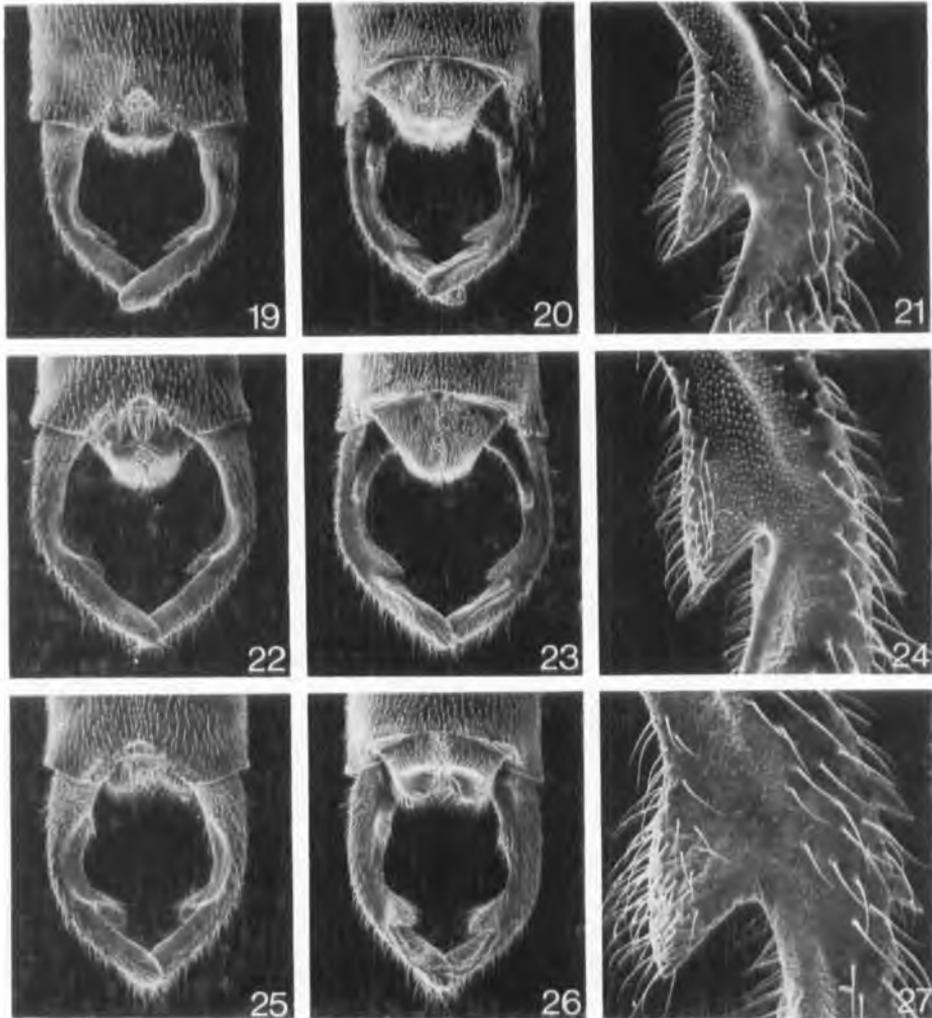
2. "Type<sub>2</sub> 12137" (red, MCZ label); "Hagen." (white, printed); "Neu Holland Melbourne Thorey." [white, handwritten, probably by Hagen (Fig. 30)]. Male specimen of *Austrolestes leda*, intact.

3. "Type<sub>3</sub> 12137" (red, MCZ label); "Hagen." (white, printed); "L. Psyche" [white, handwritten, Hagen's hand, but not identical to label on first type (Fig. 31)]. Female specimen of *Austrolestes psyche*, lacking segments 7-10 of abdomen, and tip of left hind wing.

4. "Type<sub>4</sub> 12137" (red, MCZ label); "Hagen." (white, printed); "N: Hot:" [white, handwritten (Fig. 32)]; "L. Psyche" [white, handwritten, Hagen's hand, similar to label on ♀ (Fig. 33)]. Male specimen of *Austrolestes psyche*, lacking segments 6-10 of abdomen.

Selys (1862) gave "Nouvelle-Hollande" as the locality for *psyche*, which agrees with the label on the fourth type. It, and probably also the female, must have been part of the type series of *Lestes psyche* Hagen in Selys.

The label data of the other two males do not fit the type locality of *psyche*. However, they fit the localities given by Selys (1862) for *leda*: "Nouvelle-Hollande, Melbourne, coté nord-est"; the label on the first type can be interpreted as "Nord Ost Küste von Australien". Although Selys did not indicate that any of the type



FIGS 19-27—Anal appendages of male lestedids: (19-21) *Austrolestes aleison*: (19) dorsal view (x ca 27); (20) ventral view (x ca 27); (21) subapical spine, lateroventral view (x ca 110). (22-24) *Austrolestes psyche*: (22) dorsal view (x ca 27); (23) ventral view (x ca 27); (24) subapical spine, lateroventral view (x ca 110). (25-27) *Austrolestes minjerriba*: (25) dorsal view (x ca 27); (26) ventral view (x ca 27); (27) subapical spine, lateroventral view (x ca 120).

series of *leda* were in Hagen's collection, the close correlation between the text and label data, and the fact that these data do not apply to any other *Lestes* described in Selys (1862), indicate that the two males were part of the type series of *Lestes leda* Selys.

The lectotype designations follow.

*Lestes psyche* Hagen in Selys: *Lectotype* ♂, by present designation, in ANIC (Type No. 9863), "N: Holl", "Type<sub>2</sub> 12137" in original MCZ register, other labels as given above, plus handwritten red label "LECTOTYPE ♂ *Lestes psyche* Hagen in Selys 1862 desig. J. A. L. Watson 1979 A.N.I.C. Type No. 9863".

*Lestes leda* Selys: *Lectotype* ♂, by present designation, in ANIC (Type No. 9875), "Neu Holland Melbourne Thorey", "Type<sub>2</sub> 12137" in original MCZ register, other labels as given above, plus "Austrolestes leda (Selys) det. J. A. L. Watson, 1967." (white, printed) and "LECTOTYPE ♂ *Lestes leda* Selys 1862 desig. J. A. L. Watson 1979 A.N.I.C. Type No. 9875" (red, handwritten).

*Other material examined*—QUEENSLAND: seven ♂♂, North Stradbroke Island, stream draining into Brown Lake, 5-8.i.1976, J. A. L. Watson and A. H. Arthington. NEW SOUTH WALES: one ♂, two ♀♀, 3 km N of Lennox Heads, 17.i.1976, J. A. L. Watson; six ♂♂, Bullock Creek, E of Armidale on Point Lookout road, 21.ii.1962, C. W. Frazier and A. F. O'Farrell, 18.xii.1965, A. F. L. O'Farrell (UNE); two ♂♂, 38 miles (61 km) E of Armidale, 25.ii.1962, A. F. O'Farrell (UNE); one ♂, two ♀♀, Blue Mountains, 7-8.ii.1915, R. J. Tillyard; one ♂, Blackheath, Blue Mountains, 29.xi.1949, R. Dobson; one ♂, Wentworth Falls, Blue Mountains, 2.xi.1949, R. Dobson; one ♂, French's Forest, 28.iii.1948, R. Dobson; four ♂♂, one ♀, Cronulla,

20.iii.1957, R. Dobson; one ♂, one ♀, Royal National Park, xii.1907, R. J. Tillyard; two ♂♂, one ♀, Yarrunga (? Creek), 25.i.1915, R. J. Tillyard; one ♂, Ulladulla, 8.ii.1975, K. R. Norris. VICTORIA: two ♀♀, Mount Buffalo, Lake Catani, 4.iii.1967, E. F. Riek; one ♂, Gisborne, 24.xii.1908, R. J. Tillyard. SOUTH AUSTRALIA: five ♂♂, Wilpena Pound, no date, H. M. Hale, swamp, 27.x.1955, E. T. Giles (SAM). TASMANIA: two ♂♂, Cradle Mountain, 19.i.1917, R. J. Tillyard; six ♂♂, one ♀, Lake Dove, Cradle Mountain, 30.i.1967, E. F. Riek; eight ♂♂, three ♀♀, Fossey River, 10 (miles) (16 km) S of Hellyer Gorge, 5.ii.1967, E. F. Riek; three ♂♂, two ♀♀, Nivarre River, 12.ii.1967, E. F. Riek; one ♂, 5 miles (8 km) SW of Strahan, 21.i.1948, K. H. L. Key, P. B. Carne and R. W. Kerr.

### Male

*A. psyche* was characterised in detail by Selys (1862) and Ris (1910).

**Colour pattern** (Figs 1, 7, 13, 14).—Dorsal black stripe of abdominal tergite 2 constricted only slightly at centre (Fig. 13), rarely approaching the goblet-shaped mark of *A. aleison* (but cf. Fig. 14). Colour pattern otherwise much as in *A. aleison*.

**Wings**.—Hind wing averaging 17.84 mm (range 16.4–18.8 mm, N = 10); fore wing pterostigma averaging 1.444 mm long (range 1.22–1.68 mm), average breadth 0.426 mm (range 0.38–0.48 mm) (N = 10).

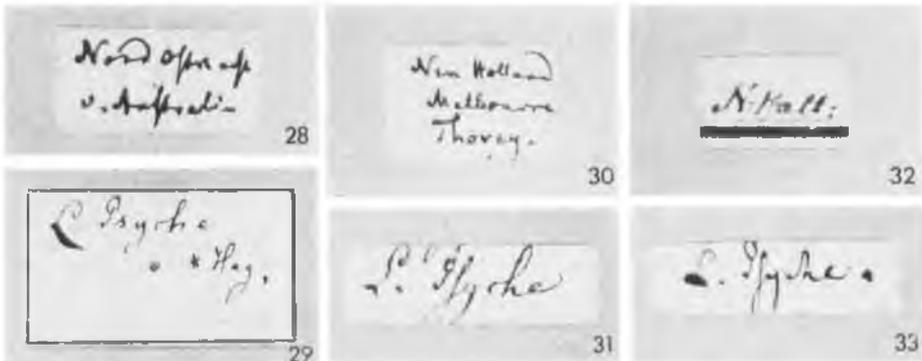
**Anal appendages** (Figs 22–24).—Superior appendages averaging 1.273 mm long (range 1.10–1.44 mm, N = 20); subapical spine broad, its anterior margin slightly convex; ventrobasal knob almost a third of appendage length from base, 0.68–0.74 × appendage length from tip, 0.36–0.41 × appendage length from point of subapical spine; inferior appendages simple.

### Female

Size variable, range marginally higher than in male; hind wing averaging 18.19 mm long (range 16.9–19.2 mm), fore wing pterostigma averaging 1.530 mm (range 1.26–1.74 mm) × 0.454 mm (range 0.42–0.50 mm) (N = 10). Colour pattern as in *A. aleison* (Fig. 8).

### Distribution and habitat

*A. psyche* occurs along the coastal and adjacent mountain areas of south-eastern Australia from south-eastern Queensland to Victoria and Tasmania, and in South Australia (Watson 1974, 1977), apparently in habitats similar to those occupied by *A. aleison* in south-western Australia—the margins of rivers and slow streams, lakes and ponds, and probably seasonally dry pools (cf. Watson 1962). The northern parts of its range overlap the range of *A. minjerriba*, and the two occur in close proximity on North Stradbroke Island and the Woolli Lakes system (Watson and Arthington unpublished report). At least on North Stradbroke Island, *A. psyche* and *A. minjerriba* show ecological separation. *A. psyche* has been recorded from only one locality, the small, reedy, intermittent stream that drains into Brown Lake; *A. minjerriba* is abundant on the lake, but has not been collected from the stream (Watson and Arthington unpublished report).



FIGS 28–33—Labels on type material of *Austrolestes psyche* and *Austrolestes leda* (x 1.5): (28, 29) Type 12137 (♂ *A. leda*, paralectotype); (30) Type<sub>2</sub> 12137 (lectotype ♂ of *A. leda*); (31) Type<sub>3</sub> 12137 (♀ *A. psyche*, paralectotype); (32, 33) Type<sub>4</sub> 12137 (lectotype ♂ of *A. psyche*).

### Indolestes Fraser

#### *Indolestes alleni* (Tillyard) and *Indolestes albicauda tindalei* (Tillyard)

**Types**.—Lectotype ♂ of *Austrolestes alleni* Tillyard, 1913: QUEENSLAND: Cairns, ix.1905, E. Allen (BMNH, not seen) (cf. Kimmins 1970). Paralectotype ♂ of *A. alleni*: locality and collector as for lectotype.

viii.1905 (ANIC). *Lectotype* ♂ of *Austrolestes albicauda tindalei* Tillyard, 1925: NORTHERN TERRITORY: Groote Eylandt, no date, N. B. Tindale (SAM, No. 120548) (cf. Watson 1969). *Paralectotypes*: three ♀♀, same data as lectotype (SAM).

*Other material of I. alleni examined*.—NORTHERN TERRITORY: two ♂♂, 12°26'S 132°58'E, ponds 1 km S of Cahill's Crossing, East Alligator River, 9.xi.1972, J. A. L. Watson; two ♀♀, 13°44'S 130°43'E, Daly River crossing environs, Butterfly Gorge, Tommies Creek, 13.vii.1974, 24.x.1974, J. F. Hutchinson. QUEENSLAND: two ♂♂, two ♀♀, Horn Island, Torres Strait, 15.i.1957, R. Dobson; two ♂♂, four ♀♀, Yarrabah Mission, scrub west of Bucki Homestead Creek, 26.x.1966, J. A. L. Watson; one ♀, Bramston Beach, near Innisfail, 30.iv.1967, D. H. Colless; one ♀, Cardwell, 3.i.1957, R. Dobson.

Tillyard (1925) briefly described a "race" *tindalei* of *Austrolestes albicauda* (McLachlan) from one male and three females collected on Groote Eylandt, in the Gulf of Carpentaria. The race was characterised by its darker coloration, and by its pale bluish abdominal segment 10. Lieftinck (1951) pointed out that *tindalei* should be referred to "*Lestes*" *alleni* Tillyard rather than to the west New Guinean "*L.*" *albicauda* [see also entry under "*alleni* Tillyard" in the lested section of Kimmins (1970)], and in 1960 placed *alleni* and *tindalei* as separate species in the subgenus *Indolestes* Fraser. Watson (1969, 1974) grouped both under the name *alleni*.

The type series, now in SAM, is complex. The lectotype ♂ and one paralectotype ♀ are *I. alleni*; another paralectotype ♀ is apparently *I. obiri* sp. n. (see below); and the third paralectotype ♀ is *Austrolestes insularis* Tillyard. The lectotype ♂ of *tindalei* is discoloured and darkened, and the female of *tindalei*, which is paler, is much obscured by a layer of lepidopteran scales; she could not have been included in Tillyard's comparisons. The dark colours of the head and thorax ascribed to *tindalei* by Tillyard can therefore be attributed to the discoloration of the male. The dark superior appendages are matched by appendages of males from Torres Strait and the Northern Territory. Blue labrum and abdominal segment 10 occur in material from both Queensland and the Northern Territory; these structures probably become blue with increasing age. The male appendages are similar to those of *I. alleni* figured by Lieftinck (1951).

*Austrolestes albicauda tindalei* Tillyard must therefore be regarded as a synonym of *Indolestes alleni* (Tillyard), a species known from north-east Queensland, Cape York and the northern parts of the Northern Territory (Watson 1974). The synonymy is as follows:

### **Indolestes alleni** (Tillyard)

*Austrolestes alleni* Tillyard, 1913: 425, Plate 45, Figs 11, 12 (♂, Cairns).

*Lestes albicauda* McLachlan; Ris, 1913: 505-506 (*partim*), Plate 23, Fig. 2 (♂, ♀, Cape York).

*Austrolestes albicauda tindalei* Tillyard, 1925: 42 (♂, ♀, Groote Eylandt) (syn. n.).

*Lestes alleni*: Lieftinck, 1951: 3-6, Figs 1, 2.

*Lestes alleni tindalei*: Lieftinck, 1951: 5.

*Lestes (Indolestes) alleni*: Lieftinck, 1960: 139-141.

*Lestes (Indolestes) tindalei*: Lieftinck, 1960: 140-141.

*Austrolestes alleni*: Watson, 1969: 159.

*Indolestes alleni*: Watson, 1974: 142.

*Indolestes alleni tindalei*: Watson, 1974: 142.

### **Indolestes obiri\*** Watson sp. n. (Figs 3, 4, 11, 34-37)

*Indolestes* sp. "o"; Watson, 1974: 142.

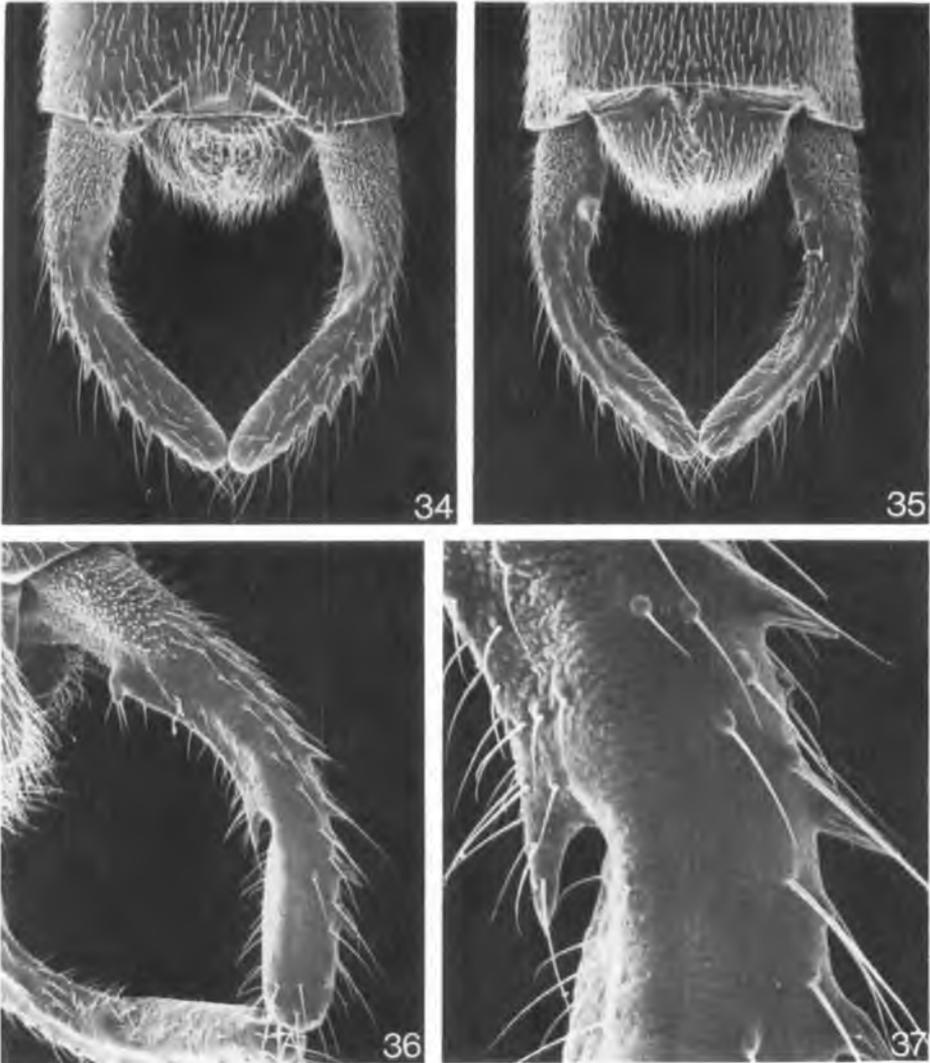
*Types*.—*Holotype* ♂, NORTHERN TERRITORY: 12°23'S 132°56'E, Cannon Hill, 7 km NW by N of Cahill's Crossing, East Alligator River, 27-28.v.1973, J. A. L. Watson (ANIC Type No. 9877) (in ANIC). *Paratypes*: NORTHERN TERRITORY: one ♀, 11°59'S 133°05'E, 5 km S by W of Tor Rock, 5.vi.1973, T. Weir; one ♀, 12°16'S 133°13'E, Birraduk Creek, 18 km E by N of Oenpelli, 4.vi.1973, T. Weir; one ♀, 12°18'S 133°17'E, 15 km SW by S of Nimbuwah Rock, 10-11.xi.1972, J. A. L. Watson; one ♂, one ♀, 12°22'S 133°01'E, 6 km SW by S of Oenpelli, 6.vi.1973, T. Weir and A. Allwood; three ♂♂, three ♀♀, same locality as holotype, 27.v.1973, T. Weir and N. Forrester; one ♂, 12°25'S 132°57'E, Oberie (= Obiri) Rock, 2 km NNW of Cahill's Crossing, East Alligator River, 29-30.v.1973, J. A. L. Watson; one ♂, 12°50'S 132°52'E, Baroalba Gorge, 19 km E by N of Mt Cahill, 8.iii.1973, J. A. L. Watson; one ♂, 12°52'S 132°47'E, Nourlangie Creek, 8 km E of Mt Cahill, 17-18.xi.1972, J. A. L. Watson; four ♂♂, one ♀, 12°52'S 132°50'E, Koongarra, 15 km E of Mt Cahill, 24-25.v.1973, J. A. L. Watson; four ♂♂, 12°55'S 132°56'E, Lightning Dreaming Gorge, 25 km E by S of Mt Cahill, 12.vi.1973, T. Weir.

One paralectotype ♀ of *Austrolestes albicauda tindalei*, from Groote Eylandt, N. B. Tindale (SAM), appears to be a very pale specimen of *I. obiri*. However, it is not to be regarded as a paratype of *I. obiri*.

#### **Male**

A sombre-coloured species, with pale brown and dull metallic green head and thorax, dark brown and cream abdomen.

\**obiri*, for Obiri (Oberie) Rock, a habitat of this cave-haunting lested; to be treated as an indeclinable noun.



FIGS 34-37—Anal appendages of male *Indolestes obiri*: (34) dorsal view ( $\times$  ca 37); (35) ventral view ( $\times$  ca 37); (36) left superior appendage, lateroventral view ( $\times$  ca 54); (37) subapical spine, lateroventral view ( $\times$  ca 190).

**Head.**—Labium yellowish; labrum and anteclypeus pale greenish brown, slightly darkened on either side of midline; mandibles and genae pale greenish brown; postclypeus pale brown, slightly and variably darkened, approximately central spot on each side; frons pale brown in front, dark greenish on top with pale middorsal stripe, forming pale T-shaped mark and upper part of anterior frons, sometimes obscured; vertex dark greenish, with pale brown ring around median ocellus, sometimes obscured, pale brown crescents beside and behind each lateral ocellus, meeting in midline, and pale spot behind each antenna; occiput pale brownish in midline, along postocellar suture, and occipital margin, leaving broad, irregular triangular green spot adjacent to eye; back of head pale brown, except for dark green upper parts of postgenae, bordering eyes; scape dark brown, pedicel dark brown in front, pale brown behind, basal segment of flagellum pale brown, darkened apically, rest of flagellum black.

**Prothorax** pale brown; median and posterior lobes with variable, dark green spots on either side of broad middorsal pale stripe; upper episternum and epimeron marked dark brown; coxa and trochanter pale yellowish brown, spinose inner surfaces of femur and tibia tinged dark brown; tarsi shaded dark brown.

**Synthorax** (Fig. 3) pale brown, marked darker as follows: collar dark brown; a dark line on each side of dorsal carina, sometimes fused with greenish band extending across mesanepisternum from collar to dark antealar ridge and sinus, which is extended towards mesopleural suture near its centre, and over its upper quarter; a shadowing along mesopleural suture from large upper dark spot to dark spot at angle of suture; a diagonal, trilobed dark green band across mesepimeron, from mesopleural suture to upper middle lateral suture; dark stripe below subalar ridge continuing into triangular patch on metanepisternum, prolonged into dark brown line reaching almost to lower end of upper metapleural suture; a variable dark brown line along

upper posterior corner of metepimeron, adjacent to poststernum; black spot on either side of poststernum; sterna apparently dark brown and yellowish brown, a dark brown midventral stripe extending across metapostcoxae.

Coxae and trochanters yellowish; femora and tibiae pale brown, lined dark brown between rows of spines; tarsi pale brown, darkened distally, claws blackish.

*Wings*.—Average length of hind wing 22.34 mm (range 21.1-23.1 mm, N = 10); hyaline, most veins dark brown, R + M and R<sub>1</sub> pale brown; pterostigma pale brown, that of fore wing averaging 1.368 mm long (range 1.28-1.40 mm), 0.566 mm wide (range 0.54-0.62 mm) (N = 10).

*Abdomen* (Fig. 11).—Tergite 1 pale brown, darker at extreme base and over distal third, posterior transverse carina dark brown; tergite 2 mainly dark brown above, with pale basal band continuing into pale lateral margin, broken middorsally by narrow dark line on either side of light middorsal stripe, and with ill-defined pale transverse band approximately two-thirds of segment from base, connecting pale lateral areas at narrowest point of brown dorsal mark to dilatation of middorsal stripe; tergites 3-6 dark brown marked creamy white, the pale marks increasingly obscured in the more posterior segments—a whitish basal band, broken above by fine dark line on each side of middorsal pale line, and broad whitish transverse band, expanded below, shading from brown approximately two-thirds of segment length from base in middorsal line, ending abruptly at dark brown band occupying distal 20% of tergite; tergite 7 similar in pattern to tergites 3-6, the pale areas variably obscured, sometimes only basal band and lateral whitish patch evident; tergite 8 dark brown, with or without pale lateral spot just basal to midpoint of segment; tergite 9 dark brown; segment 10 whitish, with dark brown posterior margin and variable basal dark brown band sometimes expanded at sides (Fig. 11), more commonly narrow, broadest middorsally.

Sternite 1 very pale brown; secondary genitalia pale and dark brown; sternites 3-7 with colour patterns matching those of corresponding tergites; sternite 8 dark brown, with pale patch on each side in distal half; sternite 9 pale brown.

*Anal appendages* (Figs 34-37).—Superior appendages averaging 1.350 mm long (range 1.30-1.42 mm, N = 10); basal quarter to third pale, apices dark brown; armature almost concealed in dorsal view, comprising ventral, backwardly curved spine bearing apical pencil of setae, and connected by low ridge to slim medioventral spine, the tip of former 0.67-0.75 ×, of latter 0.34-0.39 × appendage length from base. Interior appendages rounded, pale brown, margined darker brown.

### Female

Size as in male, hind wing averaging 22.49 mm long (range 21.6-23.2 mm), fore wing pterostigma 1.370 mm (range 1.30-1.42 mm) × 0.584 mm (range 0.54-0.62 mm) (N = 9), the abdomen stockier and shorter than in male, segments 8-9 swollen. Colour and pattern as in male, but dark markings, particularly of synthorax, less extensive (Fig. 4), and in female from Groote Eylandt much less extensive and paler, as in *I. allenii*; middorsal pale stripe on tergite 3 of almost uniform width, not distended into pale spot; whitish bands on tergites 3-6 less well defined than in male, the subapical band narrower; tergites 8-9 sometimes showing dark middorsal line and apical band, the adjacent areas slightly paler brown, the lateral parts of tergite pale brown.

### Habitat

All but one of the known specimens of *I. obiri* were taken along the Arnhem Land escarpment and its outliers, where the damselflies frequent shallow caves and overhangs. The breeding grounds are unknown, although a male was taken, apparently on territory, over the upper floodwaters of Baroalba Creek in March 1973.

### References

- CHAO, H. F. (1953).—The external morphology of the dragonfly *Onychogomphus ardens* Needham. *Smithson. misc. Collns* 122(6): 1-56.
- FRASER, F. C. (1960).—“A Handbook of the Dragonflies of Australasia”. Royal Zoological Society of New South Wales: Sydney.
- KIMMINS, D. E. (1970).—A list of the type-specimens of Odonata in the British Museum (Natural History) Part III. *Bull. Br. Mus. nat. Hist. (Ent.)* 24: 171-205.
- LIEFTINCK, M. A. (1951).—Results of the Archbold Expeditions. No. 64. Odonata of the 1948 Cape York Expedition, with a list of the dragonflies from the peninsula. *Am. Mus. Novit.* 1488: 1-46.
- LIEFTINCK, M. A. (1960).—Considerations on the genus *Lestes* Leach with notes on the classification and descriptions of new Indo-Australian species and larval forms (Odonata, Lestidae). *Nova Guinea (Zool.)* 8: 127-171.
- RIS, F. (1910).—Odonata. In “Die Fauna Südwest-Australiens” 2: 417-450. Fischer Verlag: Jena.
- RIS, F. (1913).—Odonata von den Aru- und Kei-Inseln gesammelt durch Dr. H. Merton 1908 nebst Übersicht über die von den Aru-Inseln bekannten Odonaten. *Abh. senckenb. naturforsch. Ges.* 34: 503-536.
- SELYS-LONGCHAMPS, E. DE (1862).—Synopsis des Agrionines, seconde légion: *Lestes*. *Bull. Acad. r. Belg. Cl. Sci.* (2) 13: 288-338 (published separately, Brussels, pp. 1-54).
- TILLYARD, R. J. (1908).—The dragonflies of south-western Australia. *Proc. Linn. Soc. N.S.W.* 32: 719-742.
- TILLYARD, R. J. (1913).—On some new and rare Australian Agrionidae (Odonata). *Proc. Linn. Soc. N.S.W.* 37: 404-479.
- TILLYARD, R. J. (1925).—Odonata, Neuroptera and Trichoptera from Groote Eylandt, Gulf of Carpentaria. *Rec. S. Aust. Mus.* 3: 41-44.

- WATSON, J. A. L. (1958).—A key to the dragonflies (Odonata) of south-western Australia. *W. Aust. Nat.* **6**: 138-150.
- WATSON, J. A. L. (1962).—"The Dragonflies (Odonata) of South-Western Australia". Western Australian Naturalists' Club: Perth.
- WATSON, J. A. L. (1969).—Australasian dragonflies described by R. J. Tillyard, with the location of types and the designation of lectotypes. *J. Aust. ent. Soc.* **8**: 153-160.
- WATSON, J. A. L. (1974).—The distributions of the Australian dragonflies (Odonata). *J. Aust. ent. Soc.* **13**: 137-149.
- WATSON, J. A. L. (1977).—The distributions of the Australian dragonflies (Odonata): First supplement. *J. Aust. ent. Soc.* **16**: 277-279.
- WATSON, J. A. L. and ARTHINGTON, A. H. (1978).—A new species of *Orthetrum* Newman from dune lakes in eastern Australia (Odonata: Libellulidae). *J. Aust. ent. Soc.* **17**: 151-157.

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