

**EDMUNDSIOPS HICKMANI SP. NOV., OFFADENS FRATER (TILLYARD) NOV.
COMB. AND DESCRIPTION OF THE NYMPH OF CLOEON TASMANIAE TILLYARD
(EPHEMEROPTERA: BAETIDAE) FROM TASMANIA**

by Phillip J. Suter

(with two tables and 63 text-figures)

SUTER, P.J., 2000 (31:xii): *Edmundsiops hickmani* sp. nov., *Offadens frater* (Tillyard) nov. comb. and description of the nymph of *Cloeon tasmaniae* Tillyard (Ephemeroptera: Baetidae) from Tasmania. *Pap. Proc. R. Soc. Tasm.* 134: 63–74. ISSN 0080–4703. CRC for Freshwater Ecology, c/- Department of Environmental Management and Ecology, La Trobe University Albury/Wodonga Campus, PO Box 821, Wodonga, Victoria, Australia 3689.

This describes a new species (*Edmundsiops hickmani*) of baetid mayfly (Ephemeroptera) from Tasmania, updates the earlier (1936) work by R.J. Tillyard with recognition of a new combination (*Offadens frater*) and provides the first description of the nymph of *Cloeon tasmaniae* Tillyard. *E. hickmani* and *O. frater* are common throughout southeastern Australia, whereas *C. tasmaniae* has only been recorded from Tasmania.

Key Words: Ephemeroptera, mayflies, taxonomy, *Offadens*, *Edmundsiops*, *Cloeon*, Tasmania.

INTRODUCTION

The mayflies of Tasmania have long been recognised as important aquatic insects, usually associated with trout fishing. Tillyard (1936) published his major study on Tasmanian mayflies as "The Trout-Food Insects of Tasmania". In this, Tillyard described two baetid mayflies, *Baetis frater* and *Cloeon tasmaniae*. Although Scholes (1961) refers to both these species, the nymph of *C. tasmaniae* has never been described. Following examination of the type series of *B. frater* adults and nymphs, it was clear that the nymphal series contained two species, one of which was presumably the nymph of *B. frater*. Several trips to the type locality (the Weld River east of Weldborough in northeastern Tasmania) have enabled association of both the nymphal species found in Tillyard's type series with adults. This has enabled clear identification of both stages of *B. frater* and of a previously undescribed species.

Recent publications by Lugo-Ortiz & McCafferty (1998, 1999) have changed the generic status for baetids in Australia. These publications have confirmed the views by Dean & Suter (1996) and Suter (1997) that *Baetis* does not occur in Australia. Lugo-Ortiz & McCafferty (1998, 1999) described two new genera from Australia: *Offadens*, which is consistent with Baetid Genus 1 (Dean & Suter 1996, Suter 1997), and *Edmundsiops*, a genus consistent with Baetid Genus 2 (Dean & Suter 1996, Suter 1997). In Tillyard's type series from the Weld River, both these genera were represented in the nymphal series.

It is now possible to formally recognise *Offadens frater* (Tillyard) nov. comb. in both adult and nymphal stages, and *Edmundsiops hickmani* sp. nov. is described from both life stages.

In addition, collections of *Cloeon tasmaniae* have been made from the type locality (Macquarie River at "Stewarton") and the nymphs and adults have been associated from a population in the Elizabeth River at Campbell Town. A description of the nymph of *C. tasmaniae* is provided.

MATERIALS AND METHODS

Nymphs were collected from streams by sweep net sampling using a dip net with 250 µm mesh. Flowing sections of the streams were sampled, using a kick method that disturbed the substrate and dislodged nymphs into the net held downstream of the disturbance. In pools, the net was swept through the vegetation and near bottom substrate, so that nymphs were collected. Mature nymphs were placed in rearing containers (Edmunds *et al.* 1976) which were suspended in flowing water in the stream. A single nymph was placed in each container, and they were examined twice per day until the nymph emerged. The subimago was then placed in a separate dry container until it emerged to the imago. The nymphal exuvium was placed in 75% ethanol and, when the imago emerged, it too was preserved in the sample vial with the exuvium. Additional adult material was collected by beating the riparian vegetation with a standard adult insect net with mesh of 1mm. All material was preserved in 75% ethanol.

Additional nymphal material was made available from collections made throughout Tasmania by the Hydro Electric Commission Environmental Assessment, the Inland Fisheries Commission, the Regional Assessment Programme and the Monitoring River Health Programme.

The nymphal exuvium was dissected and then mounted on slides in polyvinyl-lactophenol mountant. The wings and legs of adults were also mounted in polyvinyl-lactophenol, and the genitalia were wet-mounted in ethanol and then maintained in a separate vial containing 75% ethanol.

Illustrations were prepared with the aid of a camera lucida attached to a Leitz compound microscope. All measurements are based on a minimum of ten nymphs and expressed in millimetres. Type material is deposited in the Australian National Insect Collection (ANIC). The Monitoring River Health Programme material is deposited in the Tasmanian Museum, Hobart, and all the Victorian material is deposited in the Museum of Victoria.

Collectors abbreviations are: MV = Museum of Victoria Survey Department; LTCS = La Trobe Catchment Survey,

Museum of Victoria; TRS = Thomson River Survey, Museum of Victoria; Vic EPA = Victorian Environment Protection Authority; HEC = Hydro Electric Commission [Tasmania] Environmental Assessment; RAP = Regional Assessment Study [Tasmania]; JB = J. Blyth; PJS = P.J. Suter; PG = P. Goonan; MS = M. Suter; GS = G. Slattery; DO = D. Oldmeadow; MN = M. Nelson; MP = M. Pearson; BK = B. Knott; PH = Pierre Horwitz; BC = B. Chessman; SC = S. Chilcott.

Offadens frater (Tillyard) nov. comb.

Baetis frater Tillyard, 1936: 50 [Type species]

Baetis frater Scholes 1961: 36

Baetidae Genus 1 sp8 Suter 1997: 18

Type material

Holotype male imago: a small creek near Weldborough in northeastern Tasmania, R.J. Tillyard, British Museum of Natural History, examined. Nymphs: as for holotype, contained in paratype series, examined.

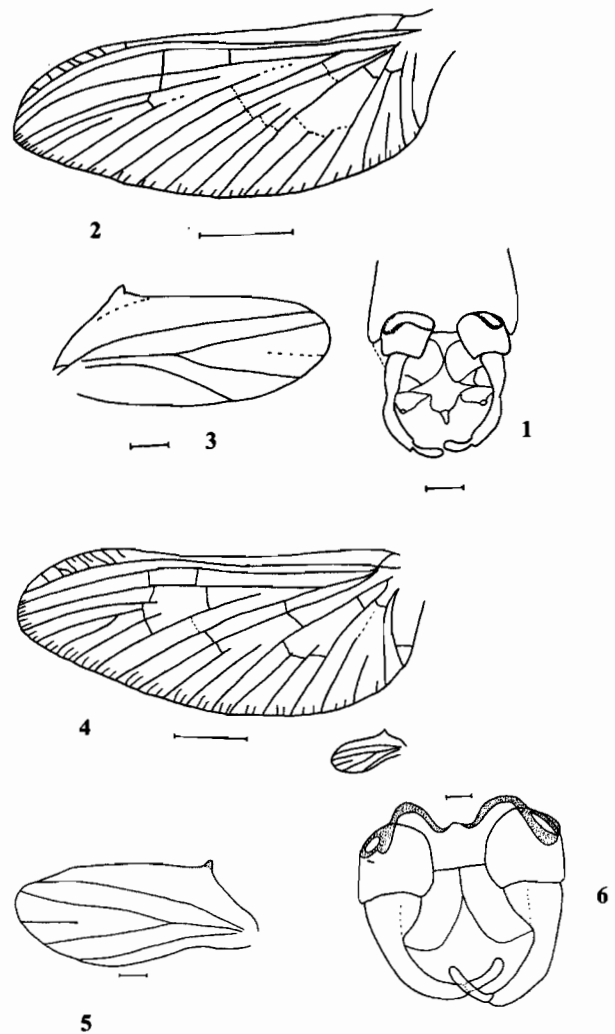
Additional material examined

Tasmania: 4 nymphs, Barrow Creek on Tasman Highway, 8.ii.1995, 41°20'S 147°23'E, PJS and PG; 2 nymphs, Break O'Day River east of Fingal, 10.ii.1995, 41°36'S 148°03'E, PJS and PG; 8 nymphs, Brid River on Tasman Highway, 8.ii.1995, 41°12'S 147°29'E, PJS and PG; 9 nymphs, Fern Tree Glen Creek near Falmouth, 10.ii.1995, 41°31'S 148°14'E, PJS and PG; 5 male imagos, 30 nymphs, George River at Goshen, 9.ii.1995, 41°07'S 148°05'E, PJS and PG; 24 nymphs, Great Musselroe River on road to Pioneer, 9.ii.1995, 41°05'S 148°03'E, PJS and PG; 1 nymph, North George River at Willows Rd, 9.ii.1995, 41°16'S 147°59'E, PJS and PG; 2 nymphs, Macquarie River at "Stewarton", 12.iii.1994, 41°49'S 147°15'E, PJS; 2 nymphs on slides, Powers Rivulet, 7.iii.1994, 41°07'S 148°09'E, PJS and MS; 12 nymphs, Ringarooma River at Pioneer, 9.ii.1995, 41°05'S 147°57'E, PJS and PG; 2 nymphs on slides, Ringarooma River at Moorina, 7.iii.1994, 41°08'S 147°52'E, PJS and MS; 1 nymph, Seven Time Creek on Tasman Highway, 8.ii.1995, 41°21'S 147°22'E, PJS and PG; 2 nymphs on slides, St Pauls River at Avoca, 9.iii.1994, 41°47'S 147°29'E, PJS; 1 nymph, St Patricks River at Nunamara, 8.ii.1995, 41°23'S 147°18'E, PJS and PG; 4 nymphs, Weld River east of Weldborough, 10.iii.1994, 41°12'S 147°55'E, PJS, 8.ii.1995, PJS and PG; *Victoria*: 1 nymph, Murray River at Bunroy Track, 5.iii.1994, 36°40'S 148°02'E, Vic. EPA. *South Australia*: 10 nymphs, Eight Mile Creek near Pt Macdonald, 15.i.1977, 38°03'S 140°48'E, PJS.

Description

Imago

The imago was fully described by Tillyard (1936) but the genitalia were not illustrated. The following is added to the original description based on the holotype and fresh specimens: forceps three-segmented, basal segment broad and rectangular, second segment long and slender, distal segment long and slender (fig.1); forelegs buff, not banded, segment ratios 1.00 : 1.89 : 0.09 : 0.80 : 0.72 : 0.72 : 0.07 (0.9 mm); mid and hind leg ratios 1.00 : 0.77 : - : 1.50 : 0.12 : 0.006 : 0.12 (0.65 mm); abdomen buff, translucent except for segments 7–10 which are brown. This is the first associated imago of the genus *Offadens*. The generic



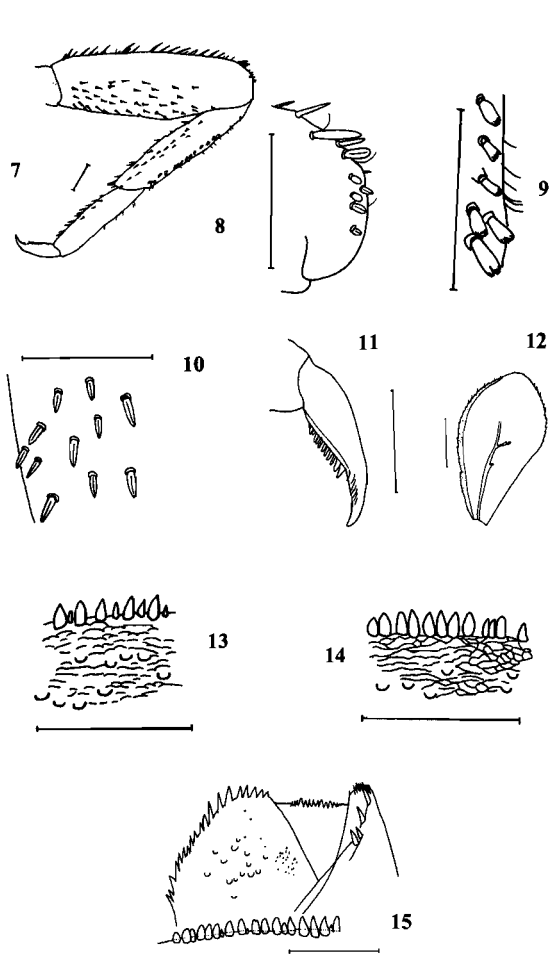
FIGS 1–6. Adults of *Offadens frater* and *Edmundsiops hickmani*. *Offadens frater* male imago: (1) Genitalia, ventral; (2) Forewing; (3) Hind wing, enlarged. *Edmundsiops hickmani* male imago: (4) Fore and hind wing; (5) Hind wing, enlarged; (6) Genitalia, ventral. Scales: figs 1, 3, 5, 6 – bar = 0.1 mm; figs 2, 4 – bar = 1 mm.

characteristics of this genus are: male compound eye turbinate, separate; two pairs of wings; forewings (fig. 2) with paired intercalaries extending from the Sc to the Cu sectors; ICuA connected basally with both CuA and CuP; hindwing with strong costal process (fig. 3); genitalia three segmented; cerci present, appendix dorsalis absent; foretarsus with 5 segments, mid and hind tarsi with only 4 segments.

Mature nymph

Body length 3.8–5.2 mm, cerci 2.0–2.3 mm, terminal filament 1.3–1.7 mm.

Pronotum narrower than head, dark grey. Mesothorax dark with light markings; metathorax with hind wing pads present in mature nymphs (fig. 61, see later, p. 71). Metathorax white. Fore legs with margins of femora with a fringe of 21–28 sharp spine setae (fig. 7), apex with short, blunt setules (fig. 8), mesial margin with numerous divided spine setae (fig. 9); fore tibiae with outer margin lined with 6–14 short blunt spine setae and few hairs (fig. 10), inner margin with 7–11 spine setae; outer margin of tarsi without



FIGS 7–15. *Offadens frater* nymph: (7) Fore leg; (8) Apex of fore femur; (9) Setae along margin of fore tibia; (10) Spines on mesial margin of fore femur; (11) Fore tarsal claw; (12) 4th gill; (13) Spines on posterior margin of 5th abdominal tergite; (14) Spines on posterior margin of 8th abdominal sternite; (15) Left paraproct, ventral. Scale: bars = 0.1 mm.

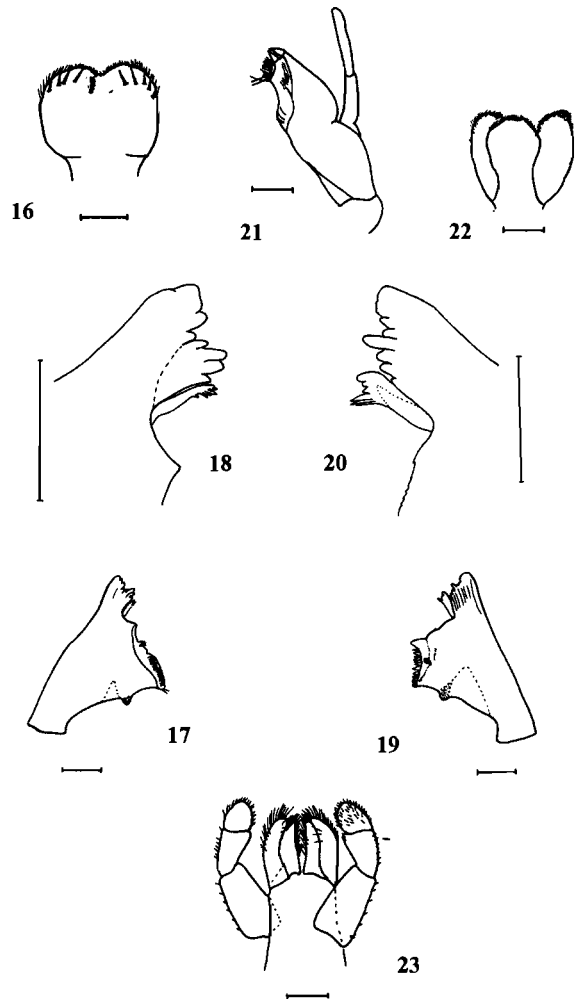
setae, but occasional short hairs present; inner margin with 9–11 short spine setae, tarsal claws with 11–13 proximal teeth (fig. 11). Middle legs with margins of femora with a fringe of 20–34 setae and few hairs; mid tibiae with outer margins with 8–15 short spine setae, inner margins with 4–11 spine setae; outer margins of tarsi with 0–7 short spine setae, inner with 8–13 spine setae; tarsal claws with 10–13 proximal teeth. Hind legs with margins of femora with a fringe of 20–27 sharp spine setae; hind tibiae with outer margin lined with 6–14 short blunt spine setae, inner margin with 5–12 spine setae; outer margin of tarsi 1–2 setae, and occasional short hairs present, inner margin with 9–11 spine setae; tarsal claws with 9–11 proximal teeth.

Ratios of leg segments:

fore leg 1.00 : 0.71 : 0.66 (0.60 mm);
 middle leg 1.00 : 0.68 : 0.59 (0.63 mm);
 hind leg 1.00 : 0.62 : 0.56 (0.67 mm).

Femur length to width ratios: fore leg 2.69 (2.30–2.94), middle leg 2.91 (2.61–3.14), hind leg 3.23 (2.91–3.75).

Abdominal segments 1–7 with single ovate plate-like gills with serrated and ciliated margins (fig. 12). Distinct colour pattern with first abdominal segment white, second



FIGS 16–23. *Offadens frater* nymph: (16) Labrum; (17) Right mandible; (18) Enlarged incisors and prostheca of right mandible; (19) Left mandible; (20) Enlarged incisors and prostheca of left mandible; (21) Maxilla; (22) Hypopharynx; (23) Labium, dorsal (left of midline) and ventral (right of midline). Scale: bars = 0.1 mm.

and third dark, fourth with a light globular pattern, fifth tergite white, sixth and seventh dark, eighth white, ninth dark and tenth white (fig. 61, p. 71). Postero-lateral margins lacking spines. Posterior margins of tergites with distinct sharp teeth and rugose surface with scale scars present (fig. 13). Posterior margins of sternites with larger teeth (fig. 14). Paraprocts with >20 well-developed spines on inner and apical margins, few scales present (fig. 15).

Labrum ovoid with a deep concavity in centre of the anterior margin, which is lined with fine setae, row of spine setae posterior to margin (fig. 16). Mandibles lack marginal setae, incisors fused with outer group blunt with “shearing” surface, inner incisors toothed. Right mandible (fig. 17) with outer incisors blunt with two inner teeth, inner incisors with 4 apical teeth, prostheca single with row of short spines apically (fig. 18), tubercle between incisors and molars well developed. Left mandible (fig. 19) with outer incisors blunt apically with 2 inner teeth, inner incisors with 1 large tooth and three smaller teeth, prostheca robust, margin between incisors and molars slightly serrated (fig. 20). Maxillae (fig. 21) with 4 blunt teeth at crown of galeo-laciniae, row of 3–4 fine simple setae near medial

hump, palp 2-segmented, apical segment longer than basal segment, palpi longer than galeo-lacinia, segment ratios 1.00 : 1.84 (0.09 mm). Hypopharynx as in figure 22. Labium (fig. 23) with glossae and paraglossae curved and pointed, labial palpi with 3 segments, mesial margin of second segment slightly produced; apical segment ovoid, proximal segment of labial palp 1.54x longer than broad, segment ratio 1.00 : 1.54 : 0.52 (0.16 mm).

Notes on *Offadens*

Offadens frater (Tillyard) was described as *Baetis frater* by Tillyard in 1936 from a small stream (the Weld River) near Weldborough in northeastern Tasmania. The adult and nymphs were described but, on examination of the holotype imago and paratype nymphs, it was clear that Tillyard had included two species of nymph in the paratype series. It was unclear from Tillyard's nymphal description which of the two nymphs he had described. Collections from the type locality indicated that both species are still common in the Weld River near Weldborough and, after numerous attempts to rear the two species, it has been established that the nymph which, when reared, has an adult identical to the holotype is consistent with *Offadens*, whereas the other species is consistent with Baetidae Genus 2 MV sp3 (Suter 1997) and here is described as a new species of *Edmundsiops*. Therefore, *B. frater* Tillyard is now recognised as *O. frater* (Tillyard) comb. nov.

Offadens frater can be distinguished from all other species in the genus by the following combination of characters: mandibles with outer incisors blunt, shearing surfaces, prosthema of right mandibles single with row of short spines apically; femora of fore leg with short spine setal fringe, apex of femora with short, divided setules; mesial margin of femora with numerous divided setae, tibiae lined with short, blunt, divided setules, but without a large apical setule, tarsi with less than five setae on outer margin, abdominal colour pattern with segments 1, 5, 8 and 10 white, 2-4, 6, 7 and 9 dark, strongly contrasting with the lighter segments.

This small species is common in riffles throughout northeastern Tasmania and occurs in Victoria and southeastern South Australia. It is likely this species is more widespread than recorded here but, because of its small size, it is often overlooked as a juvenile of a larger species in Monitoring River Health Initiative sampling, when samples are sorted in the field. Suter (1997) referred to this species as Baetidae Genus 1 sp8 and recognised that it included the Victorian Environment Protection Authority voucher species Vic EPA sp 8 and Vic EPA sp 11.

Edmundsiops hickmani sp. nov.

Baetis frater Tillyard, 1936: 50 (incorrect designation in nymphal type series)

Genus 2 MV sp 3 Suter, 1997: 20.

Type material

Holotype nymph on slides, Weld River near Weldborough, 6.iii.1994, 41°12'S 147°55'E, PJS; Paratype Material: 3 nymphs on slides, Weld River near Weldborough, 6.iii.1994, 41°12'S 147°55'E, PJS, 3 nymphs, 8.ii.1995, PJS and PG; 5 male imagos (1 on slides), Rose River at gauge station, 10.xi.1998, 36°49'S 146°34'E, MP and PJS.

Etymology

The specific epithet *hickmani* is in honour of Dr John L. Hickman who fostered taxonomic studies at the University of Tasmania and whose friendship and enthusiasm for the diversity of life has been an inspiration to me.

Material examined

Tasmania: 1 nymph, Andersons Creek at Tattersalls Rd, 26.vi.1996, 41°11'S 146°46'E, RAP; 13 nymphs, Apsley River, 5.vi.1996, 41°49'S 148°09'E, RAP; 6 nymphs, Arm River at Mersey River Junction, 29.ii.1996, 41°42'S 146°13'E, HEC; 2 nymphs, Back River at Stonehurst, 21.vi.1996, 42°31'S 147°47'E, RAP; 11 nymphs, Blackman River at Mike Howes Marsh, 4.vi.1996, 42°14'S 147°15'E, RAP; 30 nymphs, Blackman River at Old Tier Rd, 4.vi.1996, 42°10'S 147°21'E, RAP; 8 nymphs, Brid River on Tasman Highway, 8.ii.1995, 41°12'S 147°29'E, PJS and PG; 11 nymphs, Brumbys Creek upstream Palmers Rivulet on Blackwood Rd, 24.iv.1996, 41°45'S 147°01'E, HEC; 10 nymphs, Brumbys Creek at Saundridge Rd, 24.iv.1996, 41°45'S 146°59'E, HEC; 3 nymphs, Buffalo Brook at Bonneys Plain, 6.vi.1996, 41°45'S 147°38'E, RAP; 28 nymphs, Camden Rivulet, 27.vi.1996, 41°19'S 147°28'E, RAP; 1 nymph, Clarence River at Lyell Highway, 10.vii.1996, 42°08'S 146°20'E, RAP; 7 nymphs, Clyde River at Black Snake Rd Bridge, 25.iv.1996, 42°11'S 147°00'E, HEC; 19 nymphs, Cooke Creek, 8.v.1996, 43°12'S 146°38'E, RAP; 6 nymphs, Coquet Creek 4 km northeast of Nunamara, 27.vi.1996, 41°22'S 147°20'E, RAP, 14 nymphs, 1 subimago, 8.ii.1995 PJS and PG; 11 nymphs, Cygnet River at McKays Rd, 7.vi.1996, 41°57'S 147°53'E, RAP; 7 nymphs, Dans Rivulet near Mathinna, 10.ii.1995, 41°26'S 147°52'E, PJS and PG; 15 nymphs, Derwent River at Wayatinah, 10.v.1996, 42°24'S 146°29'E, HEC; 17 nymphs, Dorset River at Ringarooma, 10.ii.1995, 41°16'S 147°47'E, PJS and PG; 9 nymphs, Douglas River at Tasman Highway, 5.vi.1996, 41°47'S 148°15'E, RAP, 5 nymphs on slides, 17.i.1990, SC; 1 nymph, Dukes River at Dukes Marsh, 6.vi.1996, 41°43'S 148°08'E, RAP; 1 nymph, Fern Tree Glen Creek near Falmouth, 10.ii.1995, 41°31'S 148°14'E, PJS and PG; 18 nymphs, Fingal Rivulet at Fingal, 6.vi.1996, 41°39'S 148°00'E, RAP; 1 nymph, Fisher Creek downstream of power station, 1.iv.1996, 41°41'S 146°46'E, HEC; 8 nymphs, 10.ii.1995, PJS and PG; 1 nymph, Ford River at Roses Tier Rd, 21.vi.1996, 41°28'S 147°38'E, RAP; 1 nymph, Forth River downstream of Wolfram Mine, 30.iv.1996, 41°42'S 146°06'E, HEC; 2 nymphs on slides, Franklin Rivulet, 13.x.1994, 41°17'S 146°36'E, DO and MN; 7 nymphs, Franklin River downstream of Blackmans Bend, 14.vi.1996, 42°31'S, 145°45'E, HEC; 4 nymphs, Great Musselroe River at Tebrakunna Rd, 19.vi.1996, 41°05'S 148°04'E, RAP; 1 nymph, Great Musselroe River at New England Rd, 41°09'S 148°04'E, RAP; 3 nymphs on slides, Groom River, 7.iii.1994, 41°06'S 148°05'E, PJS; 4 nymphs, Hatfield River at Highway, 2.vii.1996, 41°32'S 145°39'E, RAP; 6 nymphs, Hellyer River at Murchison Highway, 2.vii.1996, 41°16'S 145°37'E, RAP; 4 nymphs, Huon River at Cracroft Junction, 13.vi.1996, 43°07'S 146°30'E, HEC; 1 nymph on slide, Inglis River on Jessie Rd, 19.x.1994, 41°06'S 145°35'E, DO and MN; 4 nymphs, Iris River at Cradle Rd, 5.vii.1996, 41°32'S 145°59'E, RAP;

- 4 nymphs, Jackeys Creek at Jackeys Marsh, 24.vi.1996, 41°40'S 146°39'E, RAP; 1 nymph on slide, Jane River tributary at Lightning Plains, 29.i.1989, 42°21'S 145°52'E, PH and BK; 2 nymphs, James River upstream L. Augusta, 2.v.1996, 41°51'S 146°29'E, HEC; 9 nymphs, Judds Creek upstream Judbury, 27.v.1996, 42°59'S 146°56'E, RAP; 8 nymphs, Kermandie River, 30.v.1996, 43°11'S 146°52'E, RAP; 3 nymphs on slides, Lachlan River at New Norfolk, 11.iii.1994, 42°46'S 147°00'E, PJS; 10 nymphs, Lake River at Den, 25.iv.1996, 41°58'S 147°04'E, HEC; 2 nymphs, Little Den Creek, 17.vi.1996, 42°46'S 147°08'E, RAP; 6 nymphs, Little Denison River at McDougalls Rd, 27.v.1996, 42°59'S 146°48'E, RAP; 1 nymph, Little Pine River downstream Little Pine Lagoon, 25.v.1996, 42°01'S 146°35'E, HEC; 4 nymphs, Lost Falls Creek, 18.vi.1996, 42°03'S 147°53'E, RAP; 1 nymph, Mackintosh Creek at Lake Mackintosh, 9.vii.1996, 41°38'S 145°45'E, RAP; 27 nymphs, Maclaines Creek upstream of Salmon Creek, 7.vi.1996, 42°29'S 147°51'E, RAP; 11 nymphs, Margison Creek at St Marys, 10.ii.1995, 41°35'S 148°11'E, PJS and PG; 1 nymph on slides, Meander River upstream of Deloraine, 13.x.1994, 41°32'S 146°38'E, DO and MN; 33 nymphs, Memory Creek at Upper Esk Rd, 20.vi.1996, 41°24'S 147°42'E, RAP; 1 nymph on slide, Mersey River upstream of Union Bridge, 19.x.1994, 41°32'S 146°27'E, DO and MN; 1 nymph, Mersey River downstream Rowallan Dam, 1.iv.1996, 41°42'S 146°14'E, HEC; 2 nymphs, Mersey River upstream Soda Creek 29.iv.1996, 41°33'S 146°14'E, HEC; 6 nymphs, Mersey River upstream Sales Rivulet, 24.iv.1996, 41°43'S 146°36'E, HEC; 4 nymphs on slides, Minnow Creek upstream Lower Beulah, 16.x.1994, 41°28'S 146°20'E, DO and MN; 17 nymphs, Mountain River, 27.v.1996, 42°57'S 147°07'E, RAP; 1 nymph, Mt Riveaux Creek, 31.v.1996, 43°08'S 146°41'E, RAP; 12 nymphs, Musselboro Creek, 20.vi.1996, 41°27'S 147°26'E, RAP; 3 nymphs on slides, North George River, 7.iii.1994, 41°06'S 147°59'E, PJS and MS; 11 nymphs, Nicholls Rivulet, 11.vi.1996, 43°07'S 147°19'E, RAP; 14 nymphs, Nile River at English Town Rd, 7.vi.1996, 41°34'S 147°29'E, RAP; 5 nymphs, Nive River upstream Pine Tier Lagoon, 2.v.1996, 42°02'S 146°28'E, HEC; 5 nymphs, Nive River upstream Tarraleah, 10.v.1996, 42°17'S 146°26'E, HEC; 1 nymph, Nive River downstream Pine Tier Lagoon, 10.v.1996, 42°09'S 146°29'E, HEC; 39 nymphs, North George River at Willows Rd, 9.ii.1995, 41°16'S 147°59'E, PJS and PG, 3 nymphs on slides, 7.iii.1994, PJS; 2 nymphs, North Creek, 30.v.1996, 43°17'S 146°53'E, RAP; 23 nymphs, O'Connors Rivulet, 5.vi.1996, 42°06'S 147°59'E, HEC; 9 nymphs, Ouse River on Marlborough Highway, 3.v.1996, 41°59'S 146°38'E, HEC; 4 nymphs, Peak Rivulet, 31.v.1996, 43°19'S 146°53'E, RAP; 10 nymphs, Pelverata Creek, 27.v.1996, 43°03'S 146°06'E, RAP; 13 nymphs, Pine Ck upstream Pine Tier Lagoon, 2.v.1996, 42°04'S 146°29'E, HEC; 35 nymphs, Plenty River upstream of Feilton, 30.v.1996, 42°49'S 146°56'E, RAP; 15 nymphs, Plenty River upstream of Stony Creek, 30.v.1996, 42°52' 146°51'E, RAP; 7 nymphs, Plumbers Creek 27.v.1996, 43°07'S 147°46'E, HEC; 2 nymphs on slides, Powers Rivulet, 7.iii.1994, 41°07'S 148°09'E, PJS and MS; 1 nymph, Quamby Brook at Osmaston Rd, 25.vi.1996, 41°34'S 146°46'E, RAP; 24 nymphs, Ransom Creek on Terrys Hill Rd, 9.ii.1995, 41°15'S 148°04'E, PJS and PG; 4 nymphs, Ringarooma River at Pioneer, 9.ii.1995, 41°05'S 147°57'E, PJS and PG; 13 nymphs, Ringarooma River at Maurice Rd, 20.vi.1996, 41°18'S 147°41'E, RAP; 1 nymph on slide, Ringarooma River at Moorina 7.iii.1994, PJS and MS; 6 nymphs, Russell River at Russell Pimple, 11.vi.1996, 42°57'S 146°48'E, RAP; 10 nymphs, Sandspit River at Ringrove, 17.vi.1996, 42°39'S 147°54'E, RAP; 7 nymphs, Scamander River at Hogans Rd, 4.vi.1996, 41°04'S 148°06'E, RAP; 13 nymphs, Scamander River at Upper Scamander, 4.vi.1996, 41°07'S 148°20'E RAP; 5 nymphs, Serpentine Rivulet at Marlborough Highway, 10.vi.1996, 42°08'S 146°30'E, RAP; 11 nymphs, Seven Time Creek on Tasman Highway, 8.ii.1995, 41°21'S 147°22'E, PJS and PG; 4 nymphs, Simmonds Creek at Fortescue Bay Rd, 27.v.1996, 43°07'S 147°54'E, RAP; 9 nymphs, Snowy Creek at Dens Marsh Creek, 7.vi.1996, 41°56'S 147°50'E, RAP; 60 nymphs, South Esk River at Griffin Rd Picnic Area, 10.ii.1995, 41°28'S 147°50'E, PJS and PG; 11 nymphs, South George River Intake Bridge, 9.ii.1995, 41°19'S 147°57'E, PJS and PG; 11 nymphs, South Styx River, 3.v.1996, 42°50'S 146°37'E, RAP; 13 nymphs, Southwell River, 8.vii.1996, 41°04'S 145°44'E, RAP; 18 nymphs, St Pauls River at Valley Rd, 6.vi.1996, 41°42'S 148°06'E, RAP; 14 nymphs, Stitt River upstream of Rosebery, 10.vii.1996, 41°49'S 145°32'E, RAP; 9 nymphs, Stony Creek, 30.v.1996, 42°52'S 146°59'S, RAP; 19 nymphs, Styx River on Cataract Rd, 31.v.1996, 42°47'S 146°46'E, RAP; 30 nymphs, Styx River at Styx Rd, 31.v.1996, 42°43'S 146°37'E, RAP; 16 nymphs, Styx River south of Karanja, 25.v.1996, 42°44'S 146°50'E, RAP; 4 nymphs, Swan River upstream of Hardings Falls, 5.vi.1996, 41°50'S 148°06'E, RAP; 7 nymphs, Sweets Creek at Mathinna Plains Rd, 20.vi.1996, 41°24'S 147°44'E, RAP; 5 nymphs, Tims Creek at Tyne Rd, 7.vi.1996 41°32'S 147°47'E, RAP; 12 nymphs, Tom Thumb Creek at Maurice Rd, 20.vi.1996, 41°19'S 147°41'E, RAP; 8 nymphs, Tower Rivulet at Rossarden Rd, 6.vi.1996, 41°37'S 147°52'E, RAP; 6 nymphs, Tyenna River upstream Maydena, 9.v.1996, 42°46'S 146°37'E, RAP; 60 nymphs, Tyenna River at Westerway, 11.iii.1994, 42°39'S 146°49'E, PJS; 28 nymphs, Wandle River at Murchison Highway, 2.vii.1996, 41°22'S 145°35'E, RAP; 13 nymphs, Wardlaws Creek at Chain of Lagoons, 5.vi.1996, 41°41'S 148°17'E, RAP; 7 nymphs, Weavers Creek, 27.vi.1996, 41°28'S 147°23'E, RAP; 5 nymphs, Weld River near Snake Rd, 13.vi.1996, 42°57'S 146°34'E, RAP; 1 nymph on slide, Weld River at Moorina, 5.x.1994, 41°08'S 147°53'E, DO and MN; 15 nymphs, Westons Rivulet at Saundridge Rd, 24.iv.1996, 41°46'S 147°59'E, HEC; 2 nymphs on slides, Wilmot River on Spellmans Rd, 13.x.1994, 41°21'S 146°10'E, DO and MN. *Victoria*: 5 nymphs on slides, Cobungra River at Angler's Rest, 1.x.1982, 37°00'S 147°30'E, MV; 6 nymphs, Cudgewa Creek at Lucyvale, 21.xi.1996, 36°17'S 147°37'E, PJS and GS; 4 nymphs on slides, Hawthorn Creek S15, 12.viii.1979, 37°58'S 146°06'E, LTCS; 8 nymphs on slides, Little Snowy Creek, 30.ix.1982, 36°30'S 147°14'E, JB; 5 nymphs on slides, Mitta Mitta River, Glenvalley on Omeo Highway, 30.ix.1982, 36°59'S 147°31'E, JB; 105 nymphs, Rose River at gauge station, 26.viii.1998, 15.ix.1998, 10.xi.1998, 8.xii.1998, 21.xii.1998, 5.i.1999, 19.i.1999, 10.i.1999, 5.ii.1999, 36°49'S 146°34'E, MP; 156 nymphs, Rose River, 13.x.1998, 10.xi.1998, 21.xi.1998, 8.xii.1998, 21.xii.1998, 5.i.1999, 19.i.1999, 36°52'S 146°33'E, MP; 111 nymphs, Rose River at Bennies, 8.xii.1998, 21.xii.1998, 5.i.1999, 19.i.1999, 5.ii.1999, 36°57'S 146°32'E, MP; 164 nymphs Rose River, Wabonga Plateau National Park, 8.xii.1998, 21.xii.1998,

5.i.1999, 36°58'S 146°31'E, MP; 10 nymphs on slides, Snowy Creek S7, 30.ix.1982, 36°17'S 147°25'E, JB; 5 nymphs on slides, Thomson River T26, 30.xii.1976, 38°03'S 146°59'E, TRS; 3 nymphs on slides, Thomson River T22, 1.xii.1976, 37°59'S 146°38'E, TRS; 5 nymphs on slides, Western Tyers River Christmas Creek Rd, 09.v.1979, 37°53'S 146°15'E, LTCS. NSW: 3 nymphs on slides, Woodford Creek near Mt Twiss, 2.xii.1992, 33°44'S 150°09'E, BC.

Description

Male imago

Body Length 4.4–5.6 mm, cerci 11–13 mm, terminal filament absent.

Body brown, abdomen transparent, light brown, segments 8–10 cream. Antennae short 0.6 mm; turbinate eyes separate, light brown dorsally, cream laterally. Legs cream no banding, first tarsal segment (T_1) partially fused in fore leg, T_1 and T_2 fused with tibiae in mid and hind legs.

Ratio of leg segments:

fore leg 1.00 : 1.68 : 0.06 : 0.65 : 0.60 : 0.35 : 0.16 (1.1 mm);
mid and hind leg 1.00 : 1.13 : - : - : 0.12 : 0.08 : 0.21 (0.77 mm).

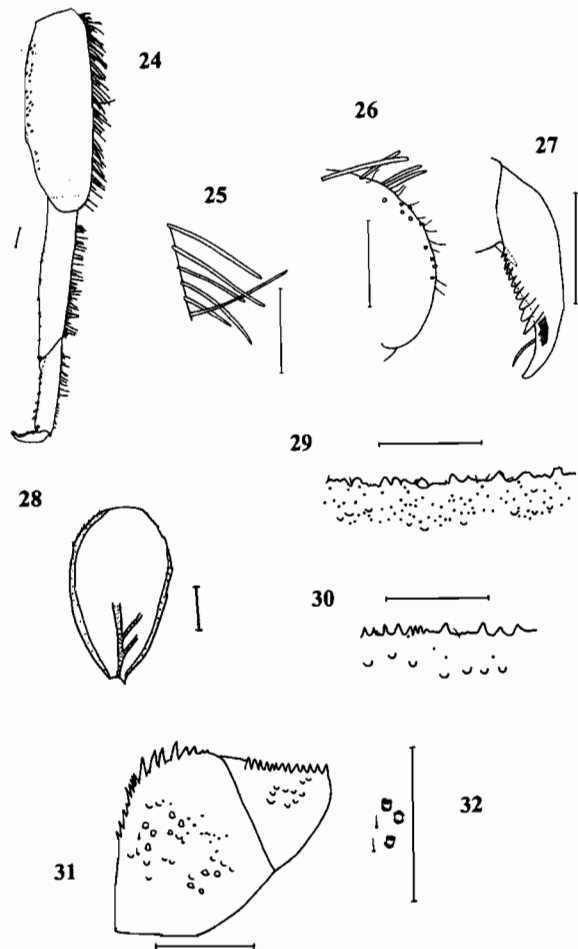
Wings hyaline, fore wing 5.0–5.7 mm long, 2.5x longer than wide, pterostigma with 7–10 cross veins, no cross veins in proximal region of costal sector, cross veins absent in subcostal sector (fig. 4). Hind wing 1.0–1.7 mm long with costal projection (fig. 5).

Cerci cream without any coloration. Genitalia with three-segmented forceps, proximal segment long approx. 1/3 length of second segment which is broad basally, narrows at 1/3 length, basal sclerite of subgenital plate concave medially (fig. 6).

Mature nymph

Body length 4.5–8.0 mm, cerci 1.4–4.9 mm, terminal filament 1.1–3.5 mm.

Pronotum narrower than head, brown along medial line. Mesothorax brown with light markings; metathorax brown, with hind wing pads present in mature nymphs. Legs buff with joints tinged dark brown, apex of tarsus and claws brown. Fore legs (fig. 24) with margins of femora with a dense fringe of 57–108 long, blunt setae (fig. 25), apex lacking spine setae, but few broad scales and hairs present, femoral extension rugose (fig. 26), mesial margin with few short spine setae; fore tibiae with outer margin lined with 16–45 long, blunt setae and numerous fine hairs, inner margin with 7–20 spine setae; outer margin of tarsi with 6–21 long, blunt setae, numerous hairs present; inner margin with 5–10 short spine setae, tarsal claws (fig. 27) with 6–13 proximal teeth and a subapical setule. Middle legs with margins of femora with a fringe of 41–96 long, blunt setae and numerous hairs; mid tibiae with outer margins with 22–49 long, blunt setae, inner margins with 9–18 spine setae and numerous hairs; outer margins of tarsi with 7–16 long, blunt setae and numerous hairs, inner with 5–8 spine setae; tarsal claws with 7–10 proximal teeth and a subapical setule. Hind legs with margins of femora with a fringe of 36–82 long, blunt setae; hind tibiae with outer margin lined with 19–46 long blunt setae and numerous hairs, inner margin with 7–18 spine setae; outer margin of tarsi with 4–17 long, blunt setae, and numerous hairs present, inner margin with 5–9 spine setae; tarsal claws with 6–12 proximal teeth and a subapical setule.



FIGS 24–32. *Edmundsiops hickmani* nymph: (24) Fore leg; (25) Foreleg femoral setae; (26) Apex of fore femur; (27) Fore tarsal claw; (28) 4th gill; (29) Spines on posterior margin of 5th abdominal tergite; (30) Spines on posterior margin of 8th abdominal sternite; (31) Left paraproct, ventral; (32) Enlarged scales on paraprocts. Scale: bars = 0.1 mm.

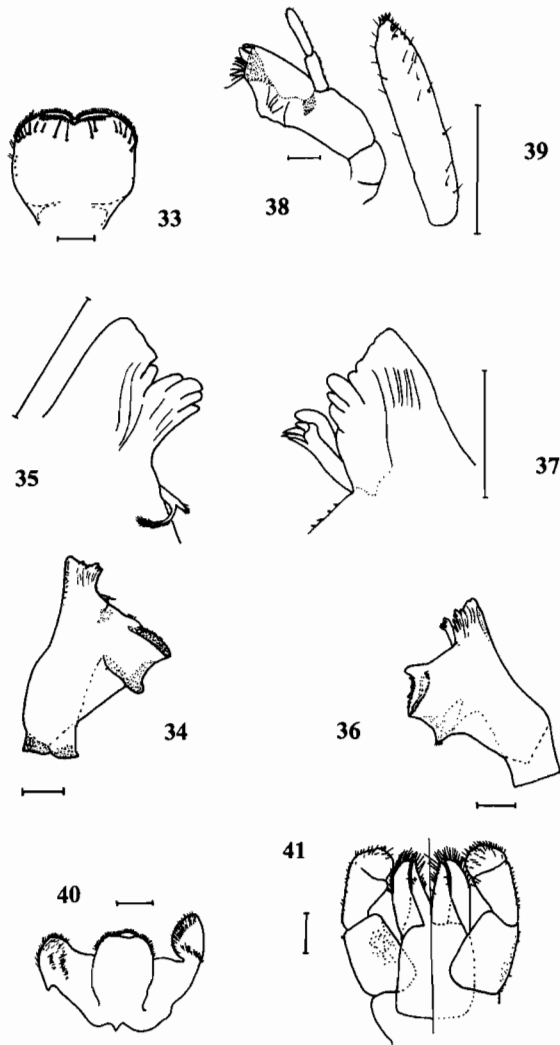
Ratios of leg segments:

fore leg	1.00:0.80:0.51 (1.09 mm);
middle leg	1.00:0.78:0.44 (1.14 mm);
hind leg	1.00:0.68:0.43 (1.12 mm).

Femur length to width ratios: fore leg 2.76 (2.28–3.53), middle leg 3.04 (2.35–3.73), hind leg 3.08 (2.39–3.74).

Abdominal segments 1–7 with single ovate plate-like gills with serrated and ciliated margins (fig. 28). Lacks a distinct colour pattern with all segments with varying patches of brown, ninth segment uniform brown, tenth segment white (fig. 62). Postero-lateral margins lacking spines. Posterior margins of tergites with blunt irregularly spaced teeth, surface with numerous hair scars and scale scars present (fig. 29). Posterior margins of sternites with larger sharp teeth and numerous hair scars and scale scars present (fig. 30). Paraprocts (fig. 31) with 9–15 well developed spines on inner and apical margins, few hair scars and scale scars present, scales rectangular and fringed apically (fig. 32).

Labrum (fig. 33) ovoid with a shallow concavity in centre of the anterior margin, which is lined with fine pinnate setae, and laterally with long fringed setae; dorsally



FIGS 33–41. *Edmundsiops hickmani* nymph: (33) Labrum; (34) Right mandible; (35) Enlarged incisors and prostheca of right mandible; (36) Left mandible; (37) Enlarged incisors and prostheca of left mandible; (38) Maxilla; (39) Enlarged terminal segment of maxillary palp; (40) Hypopharynx; (41) Labium, dorsal (left of midline) and ventral (right of midline). Scale: bars = 0.1 mm.

with row of 7–8 submedial spine setae on either side of midline. Mandibles lack marginal setae, incisors fused with outer group blunt with “shearing” surface, inner incisors toothed. Right mandible (fig. 34) with outer incisors blunt with two inner teeth, inner incisors with 4 apical teeth, prostheca bifid (fig. 35), margin between incisors and molars smooth with tuft of short bristles near molars. Left mandible (fig. 36) with outer incisors blunt apically with 2 inner teeth, inner incisors with 1 large tooth and three smaller teeth, prostheca robust (fig. 37), margin between incisors and molars serrated. Maxilla (fig. 38): palp short, 2-segmented, apical segment longer than basal segment, apically with 3 small spines (fig. 39); palpi approximately equal to galeo-lacinia length, segment ratios 1.00:1.21 (0.13 mm). Hypopharynx as in figure 40. Labium (fig. 41) with glossae and paraglossae curved and pointed, labial palpi with 3 segments, mesial margin of second segment slightly produced; apical segment ovoid, proximal segment of labial palp 1.45x longer than broad, segment ratio 1.00 : 0.81 : 0.43 (0.19 mm).

Notes on *Edmundsiops*

Edmundsiops hickmani was the second species found in Tillyard's nymphal paratype series in the British Museum of Natural History. This is the second species recognised in the genus *Edmundsiops* and can be distinguished from all other species by the following characteristics in the nymph: legs with margins of femora, tibiae and tarsi with a fringe of long, blunt, robust setae (visible in immature specimens just as thoracic wing pads begin development); abdominal colour pattern indistinct, all segments with varying patches of brown, ninth segment uniform brown, tenth segment white; mandibles with incisors fused, outer group blunt with “shearing” surface, inner incisors toothed; prostheca of right mandible bifid, margin between incisors and molars smooth with tuft of short bristles near molars; left mandible with margin between incisors and molars serrated.

The adult imago is described above, but it is consistent with most adults in the Baetidae and differs from the adult of *Offadens frater* by the fusion of the T1 and T2 with the tibiae of the mid and hind legs. It is unknown if this is consistently expressed by adults of *Edmundsiops*, and whether or not this character is a generic characteristic. As a consequence, adults collected at various sites cannot confidently be placed in a genus, whereas the nymphs clearly can be determined.

This species is widespread throughout eastern Australia in Tasmania, Victoria and New South Wales, being common in fast-flowing riffles in mountain and foothill streams that have a cobble substratum. It is one of the most commonly recorded species and is recorded as *Baetis* MVsp 3 by Metzeling *et al.* (1984), Marchant *et al.* (1985), Doeg (1984), Suter (1997) and Pardo *et al.* (1998). Details of the life cycle of *Edmundsiops hickmani* were given by Pardo *et al.* (1998).

Cloeon tasmaniae Tillyard

Cloeon tasmaniae Tillyard, 1936: 53 [Type species]
Cloeon tasmaniae Scholes 1961 (Scholes, 1961): 38

Type material

Holotype male imago: Macquarie River, “Stewarton”, 8th February, 1933, E. Scott, British Museum of Natural History.

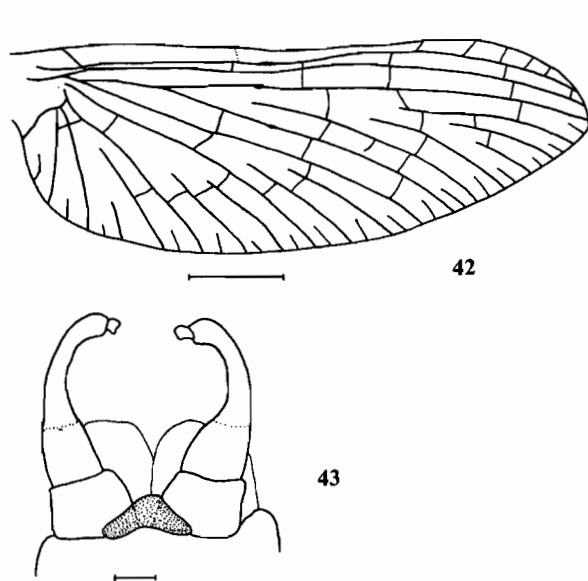
Additional material examined

Tasmania: 5 nymphs and 1 associated adult all on slides, Elizabeth River at Campbell Town, 9.iii.1994, 41°57'S 147°29'E, PJS; 2 nymphs on slides, Macquarie River at “Stewarton”, 3.vi.1990, 41°49'S 147°15'E, SC; 2 nymphs on slides, Macquarie River at “Stewarton”, 1.vii.1992, 41°49'S 147°15'E, SC; 4 nymphs, Basin Ck at Dianas Basin, 10.ii.1995, 41°22'E 148°16'E, PJS and PG; 4 nymphs, Dark Hollow Ck near Beaumaris, 10.ii.1995, 41°25'S 148°18'E, PJS and PG.

Description

Imago

The imago was fully described by Tillyard (1936) and the wing, body and genitalia were all illustrated. However, for completeness the forewing (fig. 42) and genitalia (fig. 43) of the reared adult male are presented. The generic characteristics of this genus are: male compound eye turbinate, separate; hindwing absent, forewings with single intercalaries



FIGS 42–43. *Cloeon tasmaniae* male imago. (42) Forewing; (43) Genitalia, ventral. Scales: fig. 42 – bar = 1 mm; fig. 43 – bar = 0.1 mm.

extending from the radial to the cubital sectors; forceps 3-segmented; cerci present, appendix dorsalis absent.

Mature nymph

Body length 3.1–6.5 mm, cerci 3.5 mm, terminal filament 2.8–3.0 mm.

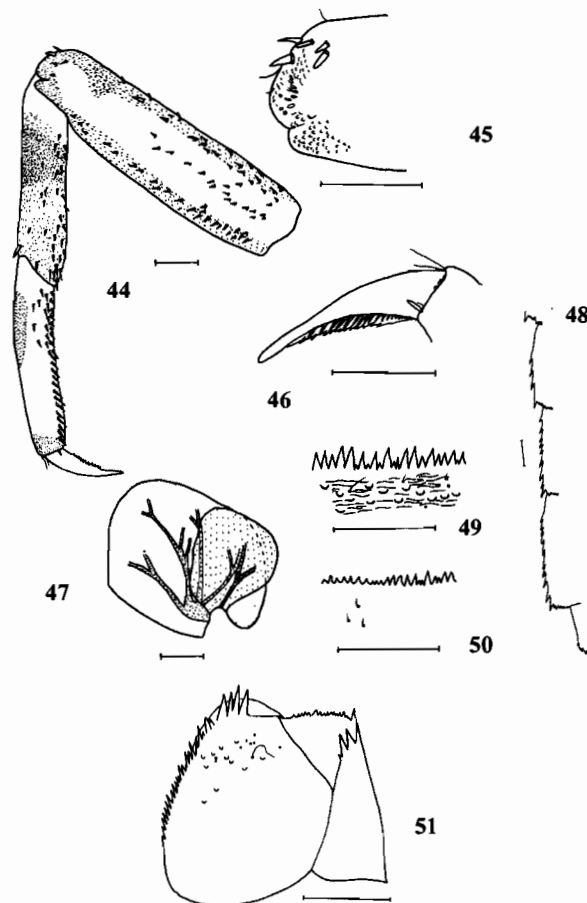
Pronotum narrower than head, light brown. Mesothorax light brown; metathorax light brown with black wing pads present in mature nymphs. Legs banded with one band per segment; fore legs with margins of femora with 9–16 short spine setae (fig. 44), mesial margin with numerous fringed spine setae, apex of femur rugose with two spines (fig. 45); fore tibiae with outer margin with few fine hairs, inner margin with 9–12 short spine setae; outer margin of tarsi without setae except 1 fringed setule at apex, occasional short hairs present; inner margin with 20–25 short fringed setae, tarsal claws long, 0.42x tarsal length, with two proximal rows of fine denticles extending over half claw length (fig. 46). Middle legs with margins of femora with 9–14 short setae and few hairs; mid tibiae with outer margins with 0–3 short spine setae and occasional hairs, inner margins with 11–17 spine setae; outer margins of tarsi without setae, few hairs present, inner with 17–20 short fringed setae; tarsal claws long, 0.46x tarsal length, with two proximal rows of fine denticles extending over half claw length. Hind legs with margins of femora with 16–28 short spine setae; hind tibiae with outer margin lined with 8–13 short spine setae, inner margin with 18–20 spine setae; outer margin of tarsi without setae, but occasional short hairs present, inner margin with 16–20 short fringed setae; tarsal claws with two proximal rows of fine denticles extending over half claw length.

Ratios of leg segments:

fore leg	1.00:0.61:0.69 (0.71 mm);
middle leg	1.00:0.66:0.60 (0.80 mm);
hind leg	1.00:0.62:0.59 (0.91 mm).

Femur length to width ratios: fore leg 4.22 (3.74–5.00), middle leg 4.45 (4.11–5.08), hind leg 5.51 (4.42–7.25).

Abdominal segments 1–7 with gills, segments 1–6 with double, round-ovate, plate-like gills and segment 7 with a



FIGS 44–51. *Cloeon tasmaniae* nymph: (44) Fore leg; (45) Apex of fore femur; (46) Fore tarsal claw; (47) 4th gill; (48) Spines on lateral margins of abdominal segments 7–10; (49) Spines on posterior margin of 5th abdominal tergite; (50) Spines on posterior margin of 8th abdominal sternite; (51) Left paraproct, ventral. Scale: bars = 0.1 mm.

single plate-like gill, all strongly tracheated (fig. 47). Dorsal colour pattern with distinct brown spots on segments 2 and 5, segments 4 and 10 light brown without markings, all other segments with dark brown patterns (fig. 63). Lateral margins of segments 5–9 with spines, postero-lateral margins with short spines (fig. 48). Posterior margins of tergites with distinct sharp teeth and slightly rugose surface with scale scars present (fig. 49). Posterior margins of sternites with short regular teeth, scale scars rare (fig. 50). Paraprocts with 15–32 well-developed spines on inner and apical margins, scales rare (fig. 51).

Labrum (fig. 52) rectangular (length 0.71x width), with a deep concavity in centre of the anterior margin, which is lined with fine fringed setae, numerous spine setae posterior to margin. Mandibles lack marginal setae, incisors separate and toothed. Right mandible (fig. 53) with outer incisors with 4 teeth, inner incisors with 3–4 teeth, inner margins rugose, prostheca robust with 5 apical teeth (fig. 54), tuft of setae between incisors and molars well developed. Left mandible (fig. 55) with 4 teeth on the outer incisors, inner incisors with 3–4 teeth, prostheca robust with 3–4 tubercles and a basal spine (fig. 56), tuft of setae between incisors and molars well developed. Maxilla (fig. 57) with a 3-segmented palp, inner margin of galeo-lacinia with 4–5

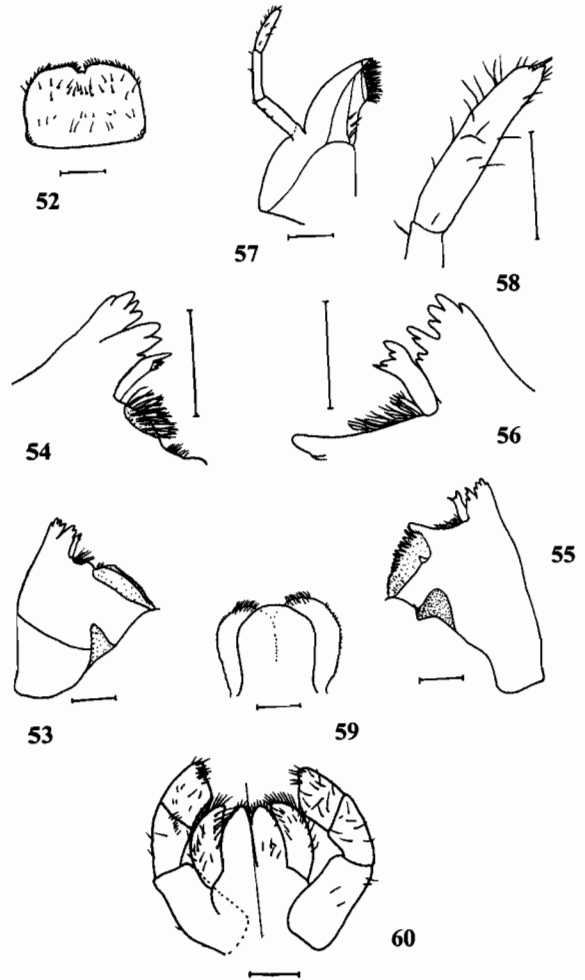
medial setae and a single inner setule, palpi longer than galeo-lacinia, apical segment with a single spine at apex (fig. 58), segment ratios 1.00:0.85:0.90 (0.20 mm). Hypopharynx (fig. 59) with rounded lingua. Labium (fig. 60) with glossae and paraglossae curved and pointed, labial palpi with 3 segments, apical segment almost square with slight apical concavity, proximal segment of labial palp 1.82x longer than broad, segment ratio 1.00:0.92:0.59 (0.20 mm).

Notes on *Cloeon*

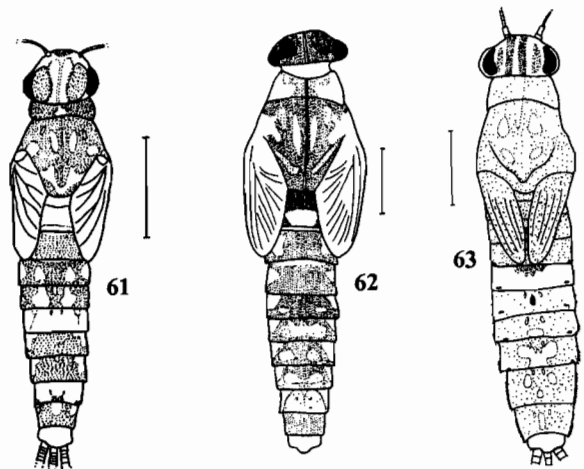
Cloeon tasmaniae was first described as an adult by Tillyard in 1936 from the Macquarie River at "Stewarton". Tillyard (1936) did not record the nymph and it has never been described. After successfully rearing a nymph from the Elizabeth River at Campbell Town, which was conspecific with nymphs from the type locality, and the adult of which was consistent with the adult description given by Tillyard (1936), it is now possible to provide a description of the nymph of *Cloeon tasmaniae*.

Cloeon tasmaniae can be distinguished from the other two fully described species of *Cloeon* from Australia (*C. fluviatile* Ulmer and *C. paradieniense* Suter) and the two other described adult species (*C. nandirum* Harker and *C. virens* Klapálek) by the following combination of characters: Adults: males with buff/pink turbinate eyes, third segment of forceps globular, femora and tibiae of fore legs long with tibia 1.8x longer than femur; females with milky opaque pterostigma. Nymphs: with banded legs, outer margin of tibiae lacking setae, inner margins of fore tibiae with <15 setae, inner margin of mid and hind tarsi with <20 setae, fore tarsus with 20–25 setae, tarsal claws all with denticles extending over half claw length, prosthema of right mandible robust with 5 apical teeth, maxillary palpi 3-segmented, apical segment of palp with spine apically, inner margin of galeo-lacinia with 4–5 medial setae and a single inner setule, hypopharynx with rounded lingua, basal segment of labium broad (length/width = 1.82), abdomen with spines on lateral margins of segments 5–9.

Tables 1 and 2 (pp. 73, 74) are an updated compilation of characters previously provided by Suter (1986) comparing the known Australian species of *Cloeon*. Characteristics for *C. virens* have been sourced from the descriptions given by Klapálek (1905) and Ulmer (1919), and for *C. nandirum* Harker's (1957) description has been used. A key is not provided at this stage, as it is likely that other undescribed species exist in Australia and it is, therefore, premature to do so. The table does provide a list of characters of the described species from which verification of identification can be made. *C. fluviatile* possesses a 2-segmented maxillary palp and not a 3-segmented palp as incorrectly recorded by Suter (1986). *Cloeon tasmaniae*, *C. paradieniense* and *C. nandirum* all possess 3-segmented maxillary palpi but *C. tasmaniae* is the only one of these three species with clearly banded legs. In addition, *C. tasmaniae* has been recorded in northern Tasmania, but it is likely to be widespread in still waters throughout the State. *C. tasmaniae* has not been recorded on the Australian mainland, while all the other species have only been recorded from the Australian mainland.



FIGS 52–60. *Cloeon tasmaniae*, nymph. (52) Labrum; (53) Right mandible; (54) Enlarged incisors and prosthema of right mandible; (55) Left mandible; (56) Enlarged incisors and prosthema of left mandible; (57) Maxilla; (58) Enlarged terminal segment of maxillary palp; (59) Hypopharynx; (60) Labium, dorsal (left of midline) and ventral (right of midline). Scale: bars = 0.1 mm.



FIGS 61–63. Dorsal colour patterns on nymphs of (61) *Offadens frater*; (62) *Edmundsiops hickmani*; (63) *Cloeon tasmaniae*. Scale: bars = 1 mm.

ACKNOWLEDGEMENTS

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TABLE 1
Tabulated comparisons of male imagos for all described species of *Cloeon* in Australia

Character	<i>Cloeon fluviatile</i> Ulmer	<i>C. paradieniense</i> Suter	<i>C. tasmaniae</i> Tillyard	<i>C. nandirum</i> Harker*	<i>C. virens</i> Klapálek†
Body length	4.1 mm	7.8 mm	7 mm	7 mm	6 mm
Forewing length	4.3 mm	7.1 mm	6 mm	4 mm	6 mm
Forewing width	1.6 mm	2.4 mm	2.4 mm	1.6 mm	2.3 mm
Cerci length	8.5 mm	15.7 mm	12 mm	?	11-12 mm
Eye colour	Sepia	Yellow	Buff-Pink	Orange	?
Pterostigma crossveins	2-4	3-4	5	4-5	5
C/Sc proximal crossveins	0	2-5	0-3	0	6
Sc/R crossveins	0	2-6	0-5	0	7
Costal colour	Milky in males and females	Milky in males, red-brown in females	Milky in males and females	Milky	Emerald green in females
Fore leg: Femur length	0.8 mm	1.48 mm	1.8 mm		
Tibia: Femur length	1.76	1.68	1.82		
Tarsus 1:Femur l	0.07	0.05	0.07		
Tarsus 2:Femur l	0.68	0.70	0.77		
Tarsus 3:Femur l	0.49	0.50	0.56		
Tarsus 4:Femur l	0.27	0.28	0.29		
Tarsus 5:Femur l	0.20	0.18	0.17		
Forceps: terminal segment	Short and narrow	Triangular	Globular	Long and narrow	Short and narrow
Penes covers	Rectangular, flat apically	Rectangular, pointed apically	Rectangular, flat apically	?	?
Dorsal body pattern	Red-brown with distinct marking on 1-7	Red-brown with light dorsal stripe on 1-7	Brown, darker from 7-10		
10th abdominal segment	Uniform red-brown	Light	Brown		

* Characteristics for *C. nandirum* after Harker (1957).

† Characteristics for *C. virens* after Klapálek (1905) and Ulmer (1916).

TABLE 2
Tabulated comparisons of mature nymphs for all described species of *Cloeon* in Australia

Character	<i>Cloeon fluviatile</i> Ulmer	<i>C. paradieniense</i> Suter	<i>C. tasmaniae</i> Tillyard	<i>C. nandirum</i> Harker*	<i>C. virens</i> Ulmer
Nymph					Unknown
Body length	5.1–6.7 mm	8 mm	3.1–6.5 mm	6.0 mm	
Cerci length	3.5–6.2 mm	6.2 mm	3.5 mm		
Terminal filament length	3.3–5.0 mm	4.6 mm	2.8–3.0 mm		
Legs	Banded	Not banded	Banded	Not banded	
Fore leg: femur length	1.01 mm	1.44 mm	0.71 mm		
Tibia/femur	0.63	0.67	0.61		
Tarsus/femur	0.63	0.58	0.69		
Femur length/width	4.92	5.18	4.24		
Tibia with apical setule	P/A	P/A	Present		
Tibial setae: outer	0–2	0–2	0		
Tibial setae: inner	15–27	25	9–12		
Tarsal setae: outer	0	0	0		
Tarsal setae: inner	19–32 on full length	44 on full length	20–25 on full length		
Tarsal claw teeth	Fine < 1/2 length	Large > 1/2 length	Large > 1/2 length		
Middle leg: femur length	1.04 mm	1.56 mm	0.80 mm		
Tibia/femur	0.64	0.67	0.66		
Tarsus/femur	0.58	0.51	0.60		
Femur length/width	4.81	6.05	4.45		
Tibia with apical setule	P/A	Absent	Present		
Tibial setae: outer	0–1	10	0		
Tibial setae: inner	12–23	32	11–17		
Tarsal setae: outer	0	0	0		
Tarsal setae: inner	16–25 on full length	27 on full length	17–20 on full length		
Tarsal claw teeth	Fine < 1/2 length	Large > 1/2 length	Large > 1/2 length		
Hind leg: femur length	1.10 mm	1.68 mm	0.91 mm		
Tibia/femur	0.62	0.79	0.62		
Tarsus/femur	0.56	0.60	0.59		
Femur length/width	4.95	6.51	5.51		
Tibia with apical setule	P/A	Present	Present		
Tibial setae: outer	0–5	19	0–1		
Tibial setae: inner	18–27	45	18–20		
Tarsal setae: outer	0	0	0		
Tarsal setae: inner	19–28 on full length	17 on apical 1/2 only	16–21 on full length		
Tarsal claw teeth	Fine < 1/2 length	Large > 1/2 length	Large > 1/2 length		
Paraproct spines	14–28	27–30	15–32		
Abdominal segments					
lateral margins spines	6–9	7–9	5–9		
Mouth parts					
Labrum: length/width	0.66	0.66	0.71		
Maxillary palpi	2 segments	3 segments	3 segments	3 segments	
Basal segment length	0.17 mm		0.12 mm		
Mid/basal segment	–	0.69	0.85		
Apical/basal segment	1.49	0.88	0.90		
Galeolacinia setae	4+1	5+1	5+1		
Hypopharynx	Convex	Convex with medial nipple	Convex		
Labial palpi: basal length	0.23 mm	0.33 mm	0.20 mm		
Mid/basal	0.76	0.56	0.92		
Apical/basal	0.65	0.48	0.59		
Basal length/width	1.96	2.74	1.82		

* Characteristics for *C. nandirum* are after Harker (1957).