



## Studies in Australian Tettigoniidae: Australian Pseudophylline katydids (Tettigoniidae; Pseudophyllinae; Phyllomimini)

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### Abstract

The genus *Acauloplacella* Karny is recorded from Australia. Four new species are described, all in the subgenus *Acauloplacella*. The Australian representatives are related to those in New Guinea. All species occur in rainforest, especially along the margins. They are known from the east coast from disjunct populations from Iron Range south to near Townsville, Qld. They are nocturnal plant feeders with males uttering a stuttering call after dark.

**Key words:** Tettigoniidae; Pseudophyllinae; Phyllomimini; *Acauloplacella*; taxonomy; biology

### Introduction

In preparation of a guidebook to Australian Tettigoniidae, it was necessary to provide the “single *Acauloplacella* Karny species” with a name. Study of the small series of specimens in collections soon revealed multiple species were present. All four species are in the one genus, *Acauloplacella*, a member of the tribe Phyllomimini. The Phyllomimini (Leaf –mimicking Katydid) comprise genera from the Old World tropics. New Guinea, for example, harbours several species. The Australian species live in the rainforest of tropical Queensland. Members of the Phyllomimini have a characteristic appearance (Fig. 1–3). At rest the boat-like tegmina are held flattened against the surface of leaves on which they sit. During the day, when they are inactive, they are usually found on the under-surface of larger leaves in the rainforest. Once they are disturbed, they assume a normal katydid stance and hop or fly from danger and promptly move to the under surface of the new site.

Distinguishing characters of the tribe Phyllomimini include the mesopleura with a small tubercle on the episternum and a broad metasternum with a transverse ridge across the anterior margin. The humeral margin of the tegmen is flexed forward and covers a portion of the pronotum (Figs. 1, 3). Most species have short, robust legs with reduced armature. The head is conical and the fastigium of the vertex is produced. The male genitalia are variously modified with the supra-anal plate, cerci and subgenital plate species-distinctive. Females have distinctive supra-anal and subgenital plates and a strongly falcate ovipositor distinctive in its armature.

The most important taxonomic characters in *Acauloplacella* are those of size, colour (including patterns on the tegmina), shape of the fastigium of the vertex, the tuberculation and arrangement of tubercles on the pronotum and adjacent portions of the head, the presence or absence of pronotal and occipital carina. The genitalia have many distinctive features, both in male and female. These have not been studied in detail before. Male characters of interest include the tenth tergite, supra-anal plate, cercus, ridges and tubercles in the intercercal region, subgenital plate. The stridulatory file and the structure of the mirror on the *right* tegmen also have valuable taxonomic characters. The titillators are also species distinctive but are very delicate and weakly sclerotised. Females have a distinctive tenth tergite and supra-anal plate. The subgenital plate is small

and poorly sclerotised. The ovipositor often has distinctive tubercles or ridges at its base and serrations on the dorsal or ventral margin. In addition, several species have distinctive ridges or carinae on the sides of the ovipositor near the tip. Eggs of one species have been examined and are, in themselves, peculiar.

Beier (1954) in the key in his monograph divided *Acauloplacella* into two subgenera based on the development of the “stalk” of the male subgenital plate and the divergence of the subcosta and radius of the tegmen. The subgenus *Acauloplacella* is defined by species that possess an “unstaked” male subgenital plate that is distally only moderately narrowed and terminally deeply split and the subcosta and radius of the tegmen being strongly divergent near the middle. His new subgenus *Papuaprium* was defined as having the male subgenital plate distally strongly narrowed and thin, with a long stalk which is forked. The subcosta and radius of the male tegmen was said to be distally gradually and weakly divergent. Eades and Otte (2010) list four species in the subgenus *Acauloplacella* and three in *Papuaprium*. We add three species to the former and a single species to *Papuaprium*. However, it would not be too surprising to discover that the characters defining these subgenera are not as definitive as Prof. Beier originally thought.



**MAP 1.** Known distributions for Australian *Acauloplacella* species. The symbols are notational; consult the “Specimens Examined” for full details. ● = *A. queenslandica*; ◆ = *A. incisa*; ▼ = *A. hasenpuschae*; ▲ = *A. mecyana*.

*Acauloplacella* katydids have a soft integument. The wings are flimsy and quite pliable. The external genitalia, comprising the tenth tergite, supra-anal plate, cercus and subgenital plate are all very lightly sclerotised and shrivel almost unrecognisably in dry material. To understand these structures it is necessary to clip off the end of the abdomen and relax it and either place it over night in 10% potassium hydroxide solution and then store it permanently in 70% ethanol or place the abdomen directly into ethanol. Even with these procedures, the cerci and other structures may not reveal themselves properly. If it is desired to have the tip of the abdomen dry-preserved, after study, the abdomen can be run through an ascending series of alcohol to 100% and then removed and dried. If possible, it is best to have both dry and alcohol-preserved material. It is our experience that these species are not attracted to lights in Australia. However, other members of the tribe are frequently found near lights elsewhere.

## Material and methods

Specimens have been borrowed from the following museums and the material is identified using the following four-letter codes: Australian National Insect Collection, CSIRO Entomology, Canberra, (ANIC). Queensland Museum, South Brisbane, (QMUS). University of Queensland, Insect Collection, St Lucia (Brisbane) (QUEN).

## *Acauloplacella* Karny

*Acauloplacella* Karny. 1931. *Treubia* 12 (Suppl.):62.

Type species: *Acauloplax asiatica* Brunner von Wattenwyl, by original designation.

Two subgenera have been defined. The nominate subgenus, *Acauloplacella*, is the only one known to occur in Australia. Four species have been described (Eades and Otte 2010). They are known from Fiji, Sulawesi, Lombok, Lesser Sunda Islands, as well as New Guinea.

The species herein described are known from the rainforests of north tropical Queensland (Map 1). They are fairly common in understorey vegetation where their noisy chirping, cricket-like calls can be easily heard after dark. However, collecting them can be very difficult if on rocky ground or in tangles of vines.

## *Acauloplacella* (A.) *queenslandica* Rentz, Su & Ueshima

ANIC Number *Acauloplacella* sp. 1

Chirping Leaf-mimic

Figs. 1; 4A; 5A, C; 6A; 7; 11; Tables 1, 2; Map 1

**Holotype male.** 1. “15.50S 145.20E Gap Ck. 5 km ESE. of Mt Finnigan nr. Cooktown, Qld. 13–16.v.1981 D. C. F. Rentz, Stop 37”. 2. “D. C. F. Rentz, Cytol. prep. 81-158” 3. “Song recorded S-85”. Holotype in Australian National Insect Collection, CSIRO Entomology, Canberra.

**Type locality.** The type locality is dense rainforest with an understorey of scattered palms, tree ferns and seedlings of a number of rainforest trees. The type was collected from a tangle of Lawyer Palm (*Calamus* sp.) approximately 2.5 m from the ground.

**Differential diagnosis.** Size small for genus, form robust. Carina present on occiput; antenna scape with tooth; antennal flagellum not annulate; only scattered tubercles on pronotal disk; no tubercles on femora; male titillator simple, tongue-like; tip of ovipositor with carinae and tubercles.

**Male.** Head. Head with prominent median carina on occiput continuous to fastigium of vertex which projects as a minute spine; frons flat, smooth, somewhat concave; genae in region of eye, sparsely tuberculate. Antenna with scape projecting well in front of fastigium of vertex, internal margin carinate and ending in a prominent tooth; pedicel 1/3 to 1/4 length of scape, with a small prominent tubercle on outer margin.



**FIGURE 1.** *Acauloplacella (A.) queenslandica* Rentz, Su, Ueshima **sp. nov.** Paratype male from Kuranda, Qld., in typical resting pose.

*Thorax.* Pronotum evenly but sparsely tuberculate, median carina comprising coalesced tubercles; surface of disk traversed by a single, deep transverse sulcus positioned near the middle of the disk and continuous onto lateral lobes; ventral margin of lateral lobe beaded, the line of beads extending onto adjacent gena. Prosternum unarmed; mesosternum with margins smooth, the transverse ridge (cephalic margin) serrate only on cephalic humeral angles; meso- and metasterna each bearing a pair of prominent pits. Auditory tympanum minute, directed posteriorly.

*Wings.* Tegmina (Fig. 4A) short, broad, well bowed on anterior margin; stridulatory vein very thick, much broader basally than distally; mirror of left tegmen strongly coriaceous, with an arching diagonal vein, mirror of right tegmen ill-defined, but coriaceous and with a pair of parallel veins running obliquely caudad from diagonal vein.

*Legs.* Fore leg with femur feebly serrate on dorsal margin, tibia unspined. Middle leg with femur dorsally carinate on both margins, ventral surface feebly serrate on both margins, posterior surface lacking tubercles; tibia dorsally tuberculate on both margins, without spines, ventral surface serrate only on anterior margin. Hind femur with external pagina irregular but not sulcate, dorsal surface carinate, ventral surface evenly serrate on external margin, internal margin not serrate; tibia quadrate, dorsal surface feebly serrate, the serrations more concentrated apically, ventral surface smooth, apex armed with a minute spine on each side of ventral surface.

*Abdomen.* Tenth tergite with apex irregular, poorly defined; supra-anal plate elongate, tongue-like extending well beyond apex of abdomen, with median carina, apically acute, surface sparsely hirsute; subgenital plate (Fig. 5A) prominently scoop-shaped, lacking a shaft, styles elongate, inflated in life. Cercus flimsy, very elongate, shrivelled in all dry material, appearing to have a stout basal tooth directed upwards, however, this tooth is not a part of the cercus but probably a paraproct. Titillator (Fig. 5C), represented as a minutely shagreened quadrate pad, longer than broad, in some specimens appearing divided.

**TABLE 1.** Measurements (in mm) of Australian *Acauloplacella* species. Localities are notational; see text for details.

Species	Length Body	Length Pronotum	Width Pronotum	Length Tegmen	Length Hind Femur	Length Ovipositor
<i>incisa</i>						
Males						
Holotype	24.0	5.2	2.7	35.0	11.3	
Kuranda	22.0	4.3	2.8	35.8	11.8	
	23.0	4.5	2.9	35.0	11.5	
	21.0	4.2	2.9	35.2	11.0	
	24.0	4.6	2.8	34.8	11.5	
Daintree	23.0	4.5	2.9	37.5	11.8	
Females						
Kuranda	28.0	5.1	3.5	40.0	14.5	14.0
	26.0	5.0	3.4	40.0	11.5	14.2
	29.0	5.2	3.5	43.3	12.2	14.0
	26.0	5.1	3.5	38.7	11.8	13.7
	28.0	5.2	3.7	42.2	12.4	13.5
<i>hasenpuschae</i>						
Males						
Holotype	20.1	3.6	2.4	30.0	10.0	
Paratopotype	20.0	3.6	2.5	28.4	9.5	
	19.0	3.8	2.5	28.9	9.1	
	17.0	3.8	2.4	26.6	10.5	
	19.0	3.8	2.5	28.8	10.2	
Females						
Paratopotype	31.4	5.0	3.5	44.3	14.0	13.5
	26.7	4.8	3.5	41.0	13.2	13.3
	28.7	4.9	3.3	40.8	11.5	12.3
	27.0	5.0	3.4	42.3	12.4	12.4
Kingfisher Pk	22.8	4.1	3.1	39.0	12.1	12.3
Bluewater Ck	28.1	4.2	3.3	39.9	12.2	11.8
<i>queenslandica</i>						
Males						
Holotype	22.4	4.1	3.0	30.8	9.7	
Claudie River	16.4	3.5	2.5	28.2	9.5	
C. Tribulation	20.0	4.5	3.1	32.0	10.2	
Kuranda	20.0	4.0	3.1	30.7	9.5	
Females						
9km Mt Tozer	24.4	4.3	2.7	37.6	12.5	12.4
Packers Ck	28.4	5.0	3.3	39.7	12.5	14.4
Iron Range	29.0	4.3	3.1	38.0	11.2	12.3
<i>mecyna</i>						
Holotype male	21.0	3.8	3.2	13.7	10.6	

*Female.* Differs from male in following: supra-anal plate ovoid, with median carina, covering cerci and base of ovipositor; subgenital plate small, broadly triangular, sides undulating, with an internal ridge, apex indented. Ovipositor with base broadly expanded, lateral margins concave; valves heavily serrate on dorsal margin (Fig. 6A), ventral margin minutely serrate; sides of ovipositor valves with 4 minute carinae and tubercles.

*Colour.* Pale green in life (Fig. 1), thorax of some specimens with a darker green circular mark on metepisternum. Cells of tegmina each with a prominent darker green spot or not. Legs light green. Beaded area of ventral lobe of pronotum and occipital carina and adjacent gena yellow.

**Specimens examined. Paratypes: Queensland:** 12°43'S. 143°18'E. 1 km ENE. of Mt Tozer, nr. Iron Range Nat. Pk., 11.vii.1986 (D. C. F. Rentz, stop I-20, 1 female from pyrethrin fog, ANIC). 12° 43'S 141° 17'E. 5km ENE. of Mt. Tozer, Iron Range Nat. Park, Qld. 10.vii.1986 (D. C. F. Rentz, Stop I-12, 1 male, collected as nymph, matured 14.vii.1986, Cytol. Prep. 86-101, Song recorded S-408, 1 female nymph, ANIC). 12°43'S 143°17'E. 9 km ENE. of Mt Tozer, Iron Range Nat. Pk, 7.vii.1986 (D. C. F. Rentz, 1 male, 1 female, ANIC). Iron Range, 26–31.v.1971 G. B. Monteith, 1 female, QUEN). Claudie Creek area, Claudie River Dist., 22–23.vi.1982 (M. A. Schneider, G. Daniels, 1 male, UQEN). Packers Creek, via Portland Rds, 6.xii.1985 (G. B. Monteith, D. Cook, 1 female, pyrethrin fog, QMUS). 16°48'S. 145°38'E. (GPS) Kuranda, 335 m elev., Top of the Range, 19 Butler Dr, 15–30.iv.2010 (D. C. F. Rentz, 1 male, ANIC). Kuranda, Black Mtn Rd, 12.iv.1989 (J. Hasenpusch, 1 male, QMUS). Cape Tribulation, 29.xii.1982–8.i.1983 (G. B. Monteith, 1 male, QMUS).

**Song.** The song of this species is a continuous chirp uttered after dark. Each chirp consists of two pulses (Fig. 7).

**Comments.** This is a small species showing variation in the degree of tuberculation of the pronotum. About half of the specimens have no trace of the tubercles on the genae that are possessed by the holotype. The male titillator appears to have a thin median line which suggests it is divided, however, this is indicated solely by colour.

### *Acauloplacella* (A.) *hasenpuschae*<sup>1</sup> Rentz, Su & Ueshima

ANIC Number *Acauloplacella* sp. 2

Sue's Leaf-mimic

Figs. 2A; 4B, C; 5B; 6C, 8A–E; Tables 1, 2; Map 1

**Holotype male.** 1. “17°28'S 146°0'E. (GPS) Qld. Garradunga, Polly Creek, nr Innisfail 18.xi.1997 J. Hasenpusch”. Holotype in Australian National Insect Collection, CSIRO, Canberra.

**Type locality.** The type locality is mixed coastal rainforest with an abundance of vines.

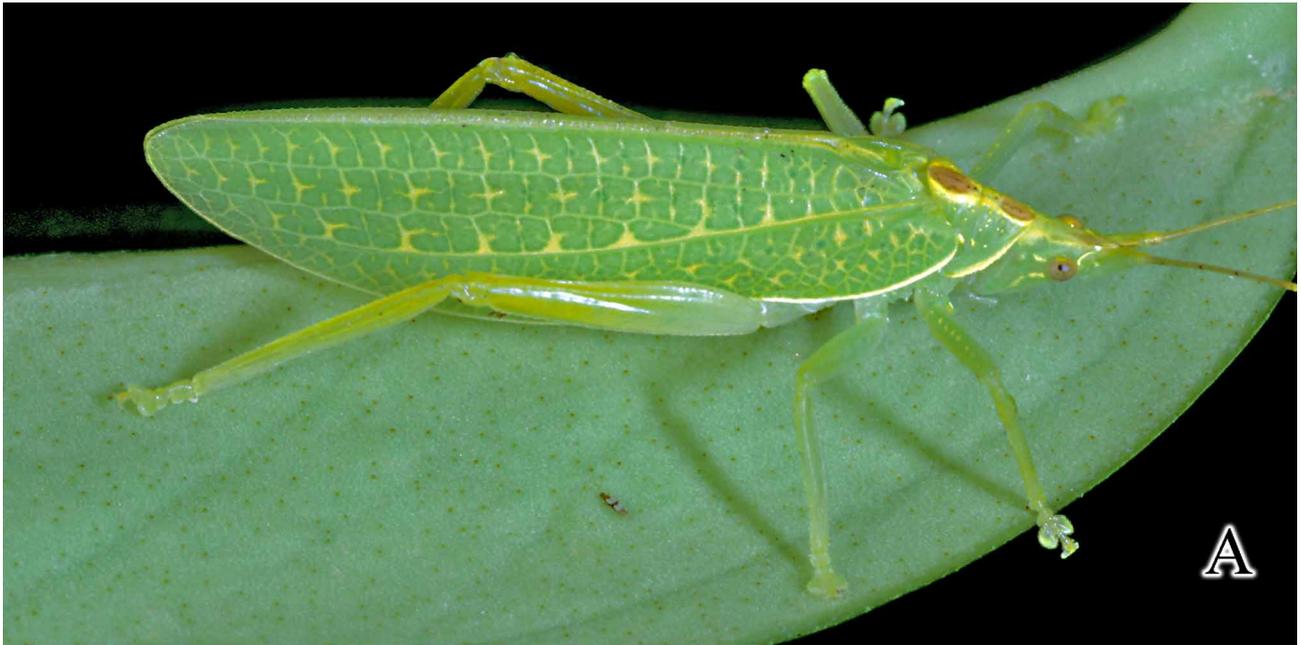
**Differential diagnosis.** Size moderate for genus, form elongate; carina absent on occiput but with sulcus; no tooth on antennal scape; tubercles absent on head; antennal flagellum with a few spots beyond 5<sup>th</sup> flagellar segment; tubercles and pattern characteristic on pronotal disk; two sulci on pronotal disk; tubercles present on fore femur; titillators poorly, if at all, sclerotised; ovipositor without tubercles or ridges laterally.

*Male. General.* This is a moderately large species (Table 1) easily recognised by the relatively broad, flat central portion of the pronotum which is emphasised by yellowish colour (Fig. 2A) and the cylindrical male cerci with a subapical hook (Fig. 5B). Females have the ovipositor with minute serrations on the dorsal and ventral margins at the tip and no tubercles or ridges on the sides (Fig. 6C).

*Head.* Head smooth, without tubercles; fastigium of vertex projecting, surface deeply and broadly sulcate; occiput without any trace of carina; frons smooth, not concave. Antenna with scape quadrate, projecting well in front of fastigium of vertex, internal margin carinate only apically, surface near apex concave and lacking an apical tooth; pedicel quadrate, about 1/3 length of scape, with a prominent tubercle at base on internal margin.

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1. Named in honour of Mrs Sue Hasenpusch, a friend and collector of many orthopteroids in the Innisfail region of north Queensland.



**FIGURE 2.** **A,** *Acauloplacella (A.) hasenpuschae* Rentz, Su, Ueshima **sp. nov.**, paratopotypic male. **B,** *Acauloplacella (A.) incisa* Rentz, Su, Ueshima **sp. nov.**, female from Kuranda, Qld.

*Thorax.* Pronotum with surface sparsely tuberculate, the tubercles not arranged in any pattern; surface of disk faintly flattened and lacking a median carina but with a single deep transverse sulcus on cephalic boundary of metanotum, this preceded by a much shallower and less defined and broader sulcus; lateral lobes feebly irregularly tuberculate. Prosternum unarmed; meso- and metasternum each more poorly indicated than in *A. queenslandica* Rentz, Su & Ueshima sp. nov; frontal ridge serrate across its entire margin. Auditory tympanum relatively prominent, circular, directed posteriorly.

*Wings.* Tegmina (Fig. 4B,C) short, broad, with prominent bow on anterior margin. Stridulatory vein short, thick, not raised; mirror weakly coriaceous and with a strong central Y-shaped longitudinal vein; right tegmen with mirror smooth and without any central venation, caudal portion with a small amount of coriaceous venation not extending much beyond border.

*Legs.* Fore leg with femur with sharp dorsal carina, not serrate, ventral surface with carinae lacking serrations, posterior surface bearing 5 prominent tubercles of equal size; tibia unspined. Middle leg with femur not dorsally carinate on either margin, ventral surface with only a suggestion of serrations apically on anterior margin. Hind leg with external pagina smooth and with a longitudinal sulcus over its entire length; tibia quadrate, somewhat swollen in proximal half, apex on ventral surface with a minute spine on each side.

*Abdomen.* Tenth tergite (Fig. 8A) with apical margin feebly irregular; supra-anal plate (Fig. 5B, 8B) very elongate, at least 2.5x as long as wide, base raised, with a short feeble median carina, apex slightly concave, margins of plate bearing long hairs; paraproct with a minute, short, slender spine, barely discernable. Cercus (Fig. 5B) prominent, rigid, short stout, cylindrical, with a minute tooth subapically, surface hirsute. Titillators represented as divided, elongate, extremely feebly, if at all, shagreened fleshy process, somewhat twisted at apex and ovoid at base; apices of adjacent fleshy lobes clothed with long hairs. Subgenital plate (Figs. 8A, B) extending upwards to or near the level of the abdomen, but not beyond; ventral surface of plate with a feeble subapical carina (Fig. 8C), stalk short, styles strongly cup-shaped, densely hirsute.

*Female.* Differs from male in following: supra-anal plate extending as an elongate flange covering most of genitalia including base of ovipositor; subgenital plate broadly triangulate, sides with distinct ridges. Ovipositor (Fig. 6C) minutely serrate on both margins, external surface without any trace of tubercles or carinae.

*Eggs.* The eggs are laid in wood, preferably bark cracks (Fig. 8D, E). They are flat and ovoid with a peculiar vesiculated area that protrudes from the surface once the egg has been laid.

*Colour.* In life pale green, with yellow as indicated (Fig. 2A); legs greenish yellow; tegmen with most veins yellow, central portion of larger cells with a darker green spot; head with fastigium of vertex and adjacent head and pronotum yellow and brown.

**Specimens examined. Paratypes: Queensland:** 17°28'S. 146°00'E. (GPS) Garradunga, Polly Creek, nr Innisfail, 10.xii.1998, 27.xi.1993, 10.ii.1994, 26.x.1994, 10.xii.1994, 12.xii.1994, 3.ii.1995, 10.xii.1995, 15.xi.1996, 18.xii.1997, 14.iii.1999, 29.ii.2000 (J. Hasenpusch, 4 males, 8 females, ANIC). Bellenden Ker Range, Cableway base station, 100 m elev., 17–24.x.1981 (Earthwatch group, 1 female, QMUS). 19°14'S. 146°29'E. Bluewater Creek, nr Townsville, 11.iv.1990 (DCF Rentz, stop 14, 1 female, ANIC). 16°36'S. 145°20'E. "Kingfisher Park", 1 km N. of Julatten, 22.iv.1997 (C. J. Burwell, 1 female, QMUS).

**Comments.** The tubercles described on the fore femur of the type are present on fewer than half of the males seen in this study. The ventral surface of fore femora may be serrate on one or both margins. This species is very distinctive in both colour and morphology and there is little chance in getting it confused with the others. Records suggest that *Acauloplacella* reaches its southern limits in the coastal forests north of Townsville.

### *Acauloplacella (A.) incisa*<sup>2</sup> Rentz, Su & Ueshima

Etched Leaf Mimic

Figs. 2B; 4D; 6B; 9A–G; Tables 1, 2; Map 1

**Holotype male.** "16°49'S 145°41'E. QLD. Smithfield, James Cook University, nr Bldg E2 30 APR 2009 DCF Rentz, G Wilson." Holotype in Australian National Insect Collection, CSIRO Entomology, Canberra.

**Type locality.** The type locality is described as a simple to complex mesophyll to notophyll vine forest on moderately to poorly drained metamorphics (excluding amphibolites) of moderate fertility of the moist and wet lowlands, foothills and uplands.

**Differential diagnosis.** Size moderate for genus, largest of known Australian species (Table 1). Most specimens have a bright white median stripe on the pronotum, extending onto the head. The colour is deep green in this species with the central portion of most cells with a dark spot (Fig. 2B). Carina on occiput either present or absent; antennal scape without tooth; head without tubercles; antennal flagellum without

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2. Named with reference to the median incision of the male tenth tergite.

annulations; tubercles on pronotal disk not forming a median carina; disk of pronotum with only median sulcus; titillators very complex; ovipositor apically with tubercles and carinae as in a. *A. queenslandica*.

*Male. General.* Head. Head smooth except for a few minute tubercles beneath eye (Fig. 9B); fastigium of vertex projecting, surface sulcate only at tip (Fig. 9A); occiput with median carina indicated mostly by colour. Antennae with scape quadrate, projecting well in front of fastigium of vertex, internal margin feebly carinate and usually lacking an apical tooth (Fig. 9A, with tooth). (See Table 2); pedicel quadrate, small, about 1/5 length of scape, with a small swelling at base on internal margin.

**TABLE 2.** Some characteristics useful in separating known Australian *Acauloplacella* species.

Character	<i>queenslandica</i>	<i>Incisa</i>	<i>hasenpuschae</i>	<i>mecyna</i>
1. Size	Small (Table 1)	Large (Table 1)	Moderate (Table 1)	Large (Table 1)
2. Carina on occiput	Present (Fig. 1)	Absent or poorly developed, with sulcus (Fig. 9A)	Absent, with sulcus	Indicated by colour, with sulcus (Fig. 10A)
3. Tooth on antennal scape	Present	Absent or present (Fig. 9A)	Absent	Absent
4. Tubercles on head	Present	Absent	Absent	Absent
5. Antennal flagellum	Not annulate	Not annulate	A few spots beyond 5 <sup>th</sup> flagellar segment	Annulate (Fig. 3)
6. Tubercles on pronotal disk	Scattered, a few forming median carina	Not forming median carina (Fig. 9B)	Characteristic (Fig. 2A)	Tubercles forming median carina (Fig. 10D)
7. Pronotal transverse sulci	Deep and continuous on metazona	Median sulcus only	Median and metazonal sulci (Fig. 9B)	Very deep median sulcus (Fig. 10D)
8. Tubercles on femora	Absent	Absent	Present on fore femur	Absent
9. Tegmina	Fig. 4A	Fig. 4B, C	Fig. 4D	Fig. 4E
10. Male tenth tergite margin, median incision	Fig. 5A	Fig. 9C	Fig. 8B	Fig. 10B, C
11. Male supra-anal plate	Fig. 5A		Fig. 8B	Fig. 10C
12. Titillators	Tongue-like (Fig. 5C)	Complex (Fig. 9F, G)	Divided, poorly sclerotised, if at all	A curving tongue-like structure (Fig. 10E, F)
13. Male subgenital plate	Scoop-shaped, no stem (Fig. 5A)	Short, styles on stem, no median incision (Fig. 9C, D)	Stem short, no median incision (Fig. 8A-C)	Stem very elongate, short median incision (Fig. 10B, C)
14. Female subgenital plate	Apex incised, laterally with ridges	Broadly triangular, weak lateral ridges (Fig. 9E)	Broadly triangulate, without lateral ridges	Unknown
15. Ovipositor	2 carinae & 2 tubercles at tip (Fig. 6A)	2 carinae & 2 tubercles at tip (Fig. 6B)	Laterally unarmed (Fig. 6C)	Unknown
16. Colour	Fig. 1	Fig. 2B	Fig. 2C	Note spots on pronotum (Fig. 10D)

*Thorax.* Pronotum with surface sparsely tuberculate, the tubercles much more reduced in size and number than in any other Australian species, the median carina topped by a series of tubercles; lateral lobes with a row to tubercles or serrations along ventral margin (Fig. 9B); cephalic and caudal margins of disk projecting and lacking tubercles; surface of disk with a thin transverse sulcus. Prosternum unarmed; meso- and metasternum each prominent, frontal ridge lacking any serrations. Auditory tympanum barely discernable.

*Wings.* Tegmina very elongate (Fig. 4D, Table 1), evenly bowed on anterior margin. Stridulatory vein extremely thickened, especially at base, mirror and remainder of stridulatory area heavily coriaceous and not really distinct from adjacent venation; right tegmen with mirror poorly defined and not coriaceous.

*Legs.* Fore leg with femur with a sharp median dorsal carina, minutely serrate or not, ventral surface lacking carinae, but minutely serrate or not on anterior or posterior margins. Middle leg with femur with a low

median carina dorsally, surface irregular, ventral surface with anterior margin carinate and minutely serrate, posterior surface without tubercles. Hind leg with outer pagina of femur with a deep, oblique longitudinal sulcus, dorsal surface with an elongate median carina, ventral surface with outer margin serrate for entire distance.

**Abdomen.** Tenth tergite with apical margin with a prominent U-shaped median incision (Fig. 9C); supra-anal plate triangular, about 3x longer than broad, apically acute and feebly directed upwards, surface with a longitudinal carina for its entire length; paraprocts a minute spine directed dorsally and completely hidden by cercus. Cercus elongate, very similar to that described for *A. queenslandica*. Titillator (Figs. 9F, G) a complex well sclerotised structure comprising a broad “tongue” followed by a “crest” (seen as a dark brown line in Figs. 9F), surrounding fleshy lobes apically bearing long hairs. Subgenital plate (Fig. 9D) with ventral surface without any trace of median carina, in other respects similar to that described for *A. hasenpuschae*.

**Female.** Differs from male in following: supra-anal plate chordate, with median carina, extending to base of ovipositor; cercus elongate, flimsy; subgenital plate (Fig. 9E) short, quadrate, with lateral ridges, sides parallel in most specimens. Ovipositor (Fig. 6B) with relatively large dorsal serrations, minute ventral serrations concentrated at apex; sides of ovipositor with 2 dorso-ventral carinae and 1–3 tubercles near apex.

**Colour.** Dark green in life with linear sequence of darker green spots on tegmina in most specimens. Median carina of head and pronotum ivory white on majority of specimens. Abdomen yellow with green rings. Ovipositor dark brown on apical dorsal and ventral margins and on ridges and tubercles, remainder straw brown.

**Specimens examined. Paratypes: Queensland:** 12°43'S. 143°18'E. 11 km ENE. of Mt Tozer, nr Iron Range Nat. Pk, 11.vii.1986 (DCF Rentz, Stop I-10, 1 male, ANIC). Daintree, 6.vi.1960 (T. G. Campbell, 1 male, ANIC). 16°48'S. 145°38'E. (GPS) Kuranda, 335 m elev., Top of the Range, 19 Butler Dr, 15–30.iv.2003; 15–31.iii.2004, 1–15.vi.2004, 15–31.i.2005, 1–15.ii.2006, 1–15.xi.2007, 16–31.vii.2008, 1–15.xii.2009 (DCF Rentz, 1 male, 7 females, ANIC). 16°48'S. 145°37'E. (GPS) Kuranda (Caravan Park) 11.xii.2004, 7.v.2007 (DCF Rentz, 2 males, ANIC). Kuranda, 12.ii.2000 (J. Hasenpusch, 1 male, ANIC). 16°49'S. 145°37'E. (GPS) 16°49'S. 145°37'E. Kuranda, (Village Service Station), 26.ii.2004 (DCF Rentz, 1 female, ANIC).

### *Acauloplacella (P.) mecyna*<sup>3</sup> Rentz, Su & Ueshima

Iron Range Leaf Mimic

Figs. 3; 4E; 10A–F; Tables 1, 2; Map 1

**Holotype male.** 1. “12.49S 143.20E 4km S. of Lockhart River (settlement) nr. Iron Range Nat. Park, QLD. 10 July 1986 D. C. F. Rentz. Stop I-17” 2. “Collected as nymph, matured in laboratory 28.vii.1986”. Holotype in Australian National Insect Collect, CSIRO Entomology, Canberra.

**Type locality.** The type locality is in an area of mixed vegetation consisting of mangroves along the river with Blady Grass (*Imperata cylindrica*) and eucalypts beyond. The type was collected on a low shrub of undetermined status.

**Differential diagnosis.** Size large for known Australian *Acauloplacella* species (Table 1). Unique colour and pattern but readily placed in the subgenus *Papuaprium* on the basis of the characters noted in the introduction. Known only from male type. Sulcus on occiput but lacking carina, indicated only by colour; no tooth on antennal scape; tubercles absent on head and femora; antenna annulate; colour on pronotum and tegmina distinct, tubercles forming median carina; pronotum with single deep median sulcus; titillators a curving tongue-like structure.

**Male. General.** Head. Head smooth, without tubercles; fastigium of vertex projecting, surface depressed and shallowly sulcate; occiput with a thin, somewhat irregular carina; frons smooth, not concave. Antenna with scape quadrate, projecting only slightly in front of fastigium of vertex, internal margin bearing a short

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3. Named with reference to the very elongate “stalk” of the male subgenital plate.

tooth, cephalic margin irregular, raised and carinate; pedicel cylindrical, not modified, and half the length of scape. Flagellum of antenna faintly annulate.

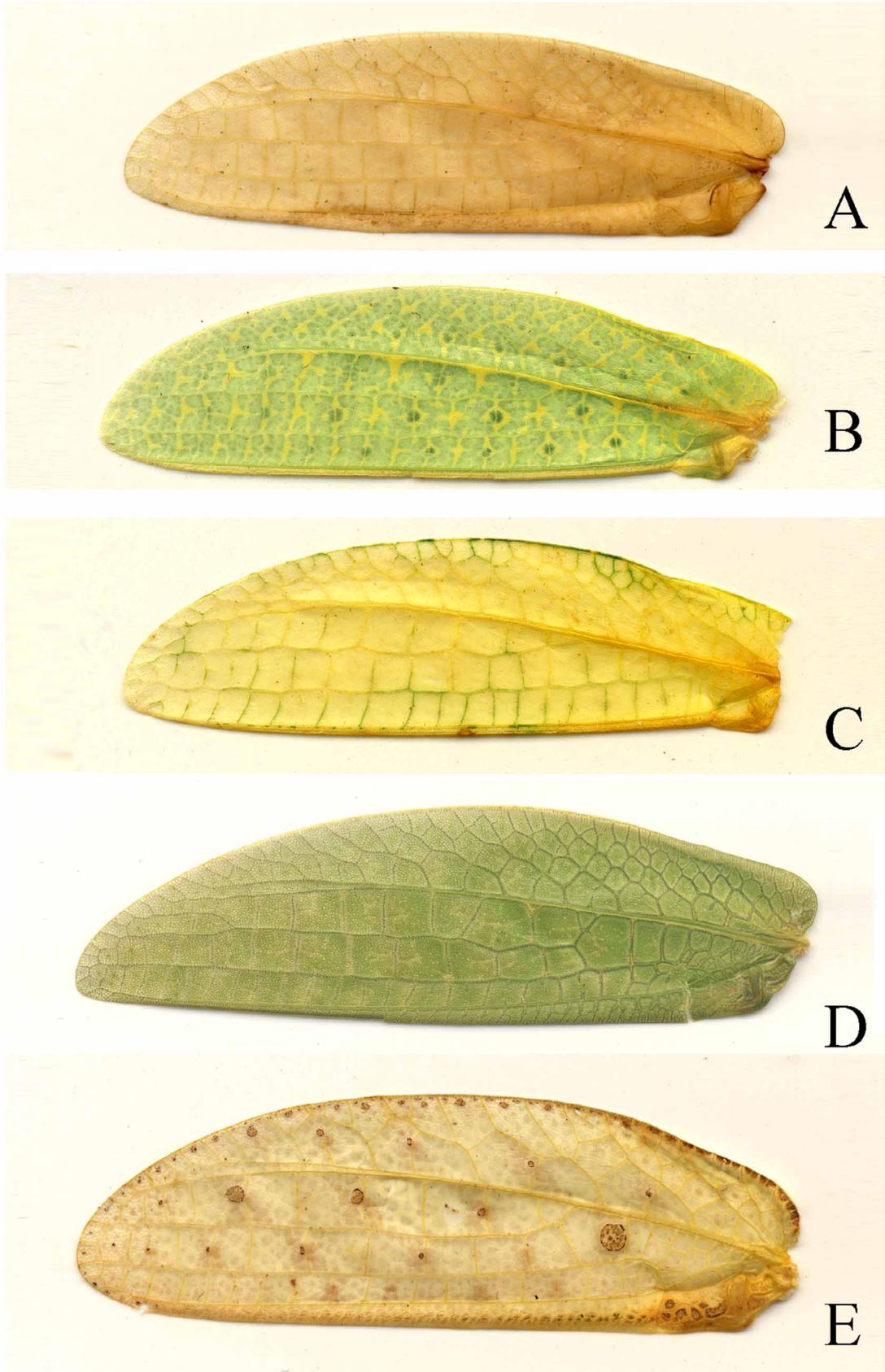
*Thorax.* Pronotum with surface very sparsely tuberculate, the tubercles minute and not forming any pattern; median carina (Fig. 10A) formed by a series of tubercles (Fig. 10D); lateral lobes smooth along cephalic and caudal margins, ventral margin heavily serrate. Surface of disk with metasternum defined by a deep transverse sulcus, lateral lobe with a sulcus bordering pro- and mesosterna. Prosternum unarmed, meso- and metasterna each with a pair of pits; frontal ridge irregular but not serrate. Auditory tympanum relatively large, ovate, directed posteriorly.



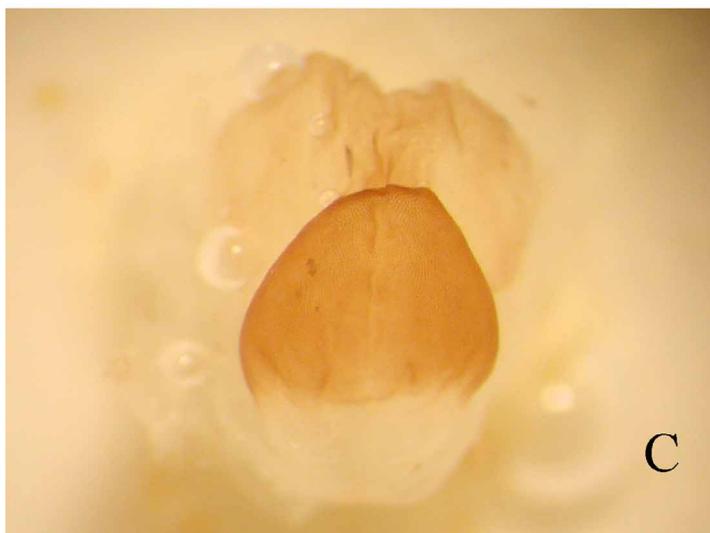
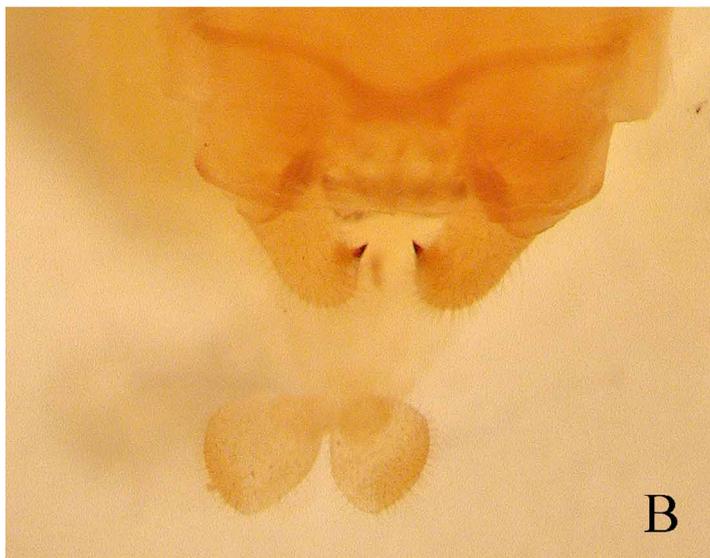
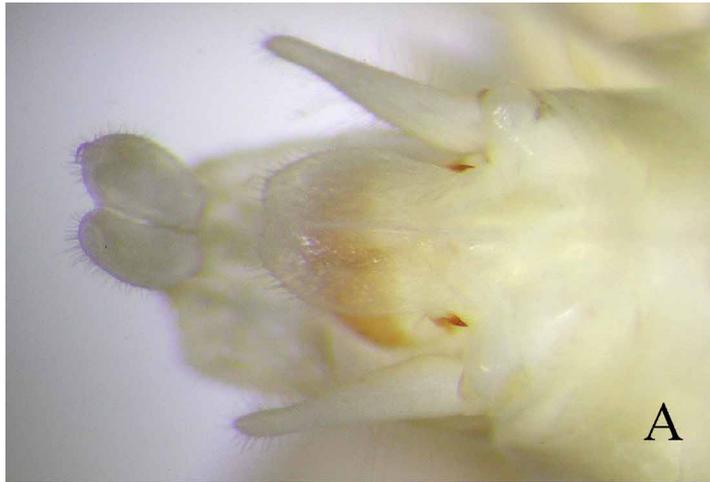
**FIGURE 3.** *Acauloplacella (A.) mecyna* Rentz, Su, Ueshima **sp. nov.** Holotype male.

*Wings.* Tegmina elongate, with a prominent bow on anterior margin (Fig. 4E). Stridulatory vein short, thick, with an accessory vein preceding; mirror weakly coriaceous and with 7 cells each with a black spot formed by a coalescence of minute dark brown to black spots; right tegmen with mirror with a weak diagonal vein and with a number of more or less parallel veins extending caudad, dark spots completely lacking.

*Legs.* Fore leg with femur bearing a prominent dorsal carina, ventral surface weakly serrate on anterior margin, posterior pagina with a few tubercles at base; tibia serrate on anterior margin of ventral surface, auditory structure swollen. Middle leg with femur smooth on dorsal surface, ventral surface serrate on anterior margin, posterior margin smooth, pagina smooth; tibia distinctly flattened and flanged, anterior surface sulcate, ventral margin serrate, dorsal surface with tubercles on both margins. Hind leg with outer surface of femur smooth and with a median longitudinal sulcus over its entire length, ventral surface serrate along entire outer margin; tibia quadrate and flanged on outer ventral margin at base, internal margin with a few minute serrations.



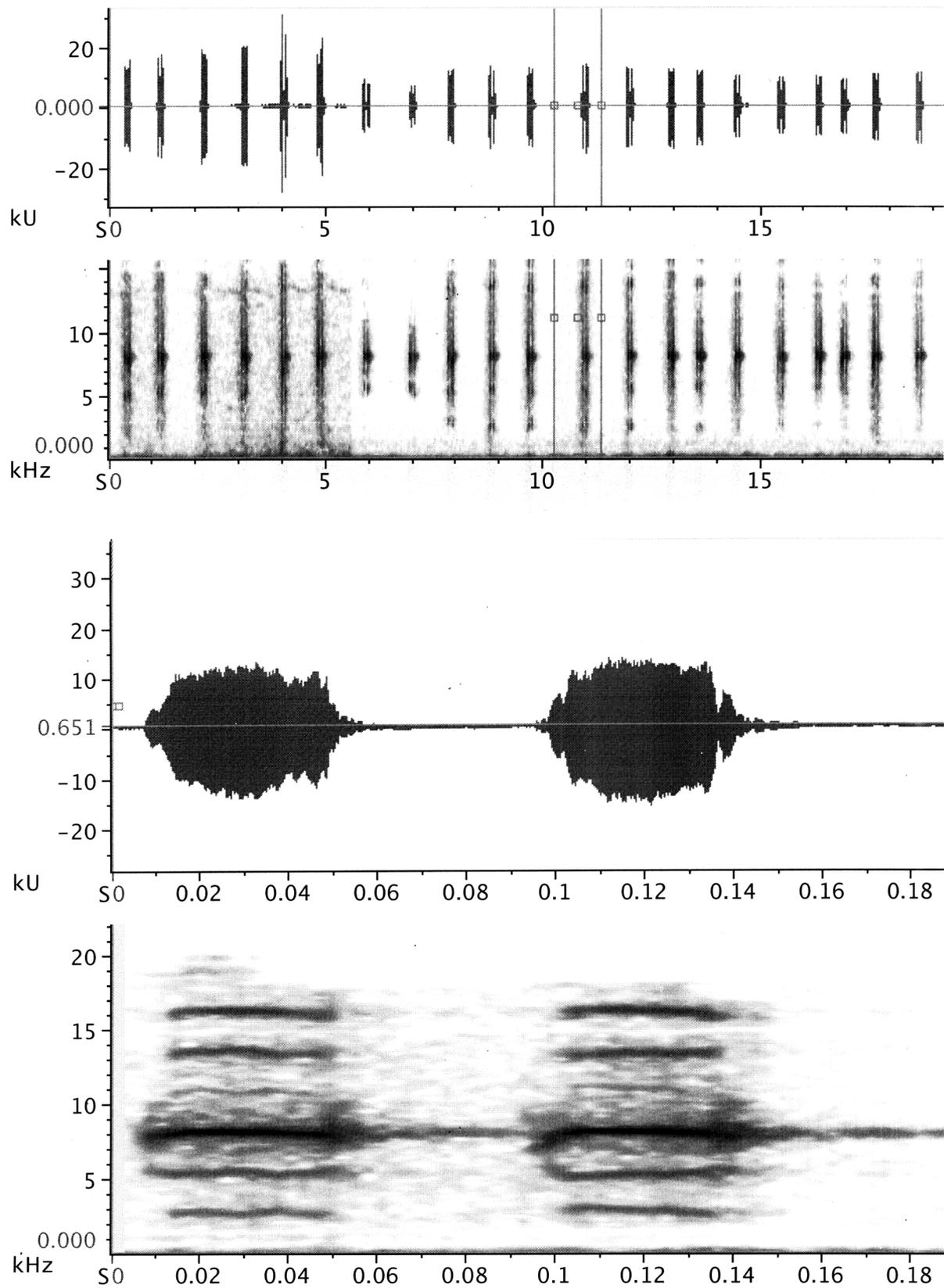
**FIGURE 4.** Left tegmen of males of Australian *Acauloplacella* species. **A**, *A. (A.) queenslandica* Rentz, Su, Ueshima **sp. nov.** **B**, *A. (A.) hasenpuschae* Rentz, Su, Ueshima **sp. nov.**; note intensive colour and patterning. **C**, same taxon illustrating lack of pattern and spots. **D**, *A. (A.) incisa* Rentz, Su, Ueshima **sp. nov.** **E**, *A. (A.) mecyna* Rentz, Su, Ueshima **sp. nov.**, holotype.



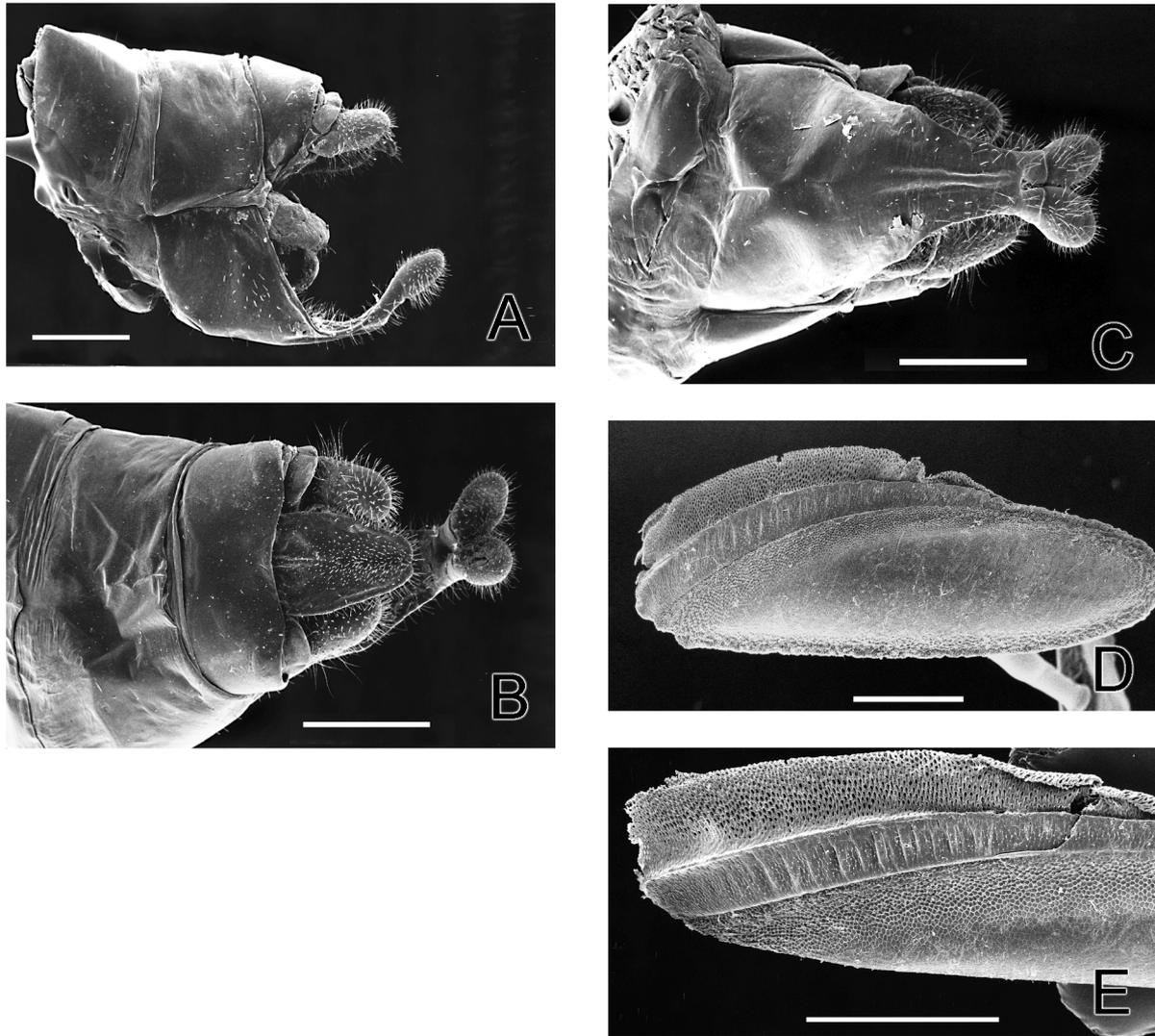
**FIGURE 5.** *Acauloplacella* (*A.*) *queenslandica* Rentz, Su, Ueshima **sp. nov.** **A**, Apex of abdomen, holotype male. Note elongate, tapered cerci and hooks of paraprocts (see text) and short supra-anal plate with slightly indented apex. The styles of the subgenital plate protrude from beneath. **B**, *A. (A.) hasenpuschae* Rentz, Su, Ueshima **sp. nov.** apex of abdomen, paratopotypic male. The supra-anal plate has been folded downwards revealing the cerci with subapical tooth. **C**, *A. (A.) queenslandica* Rentz, Su, Ueshima **sp. nov.**, titillator. Note shagreened surface and setae along margin of lobes.



**FIGURE 6.** Ovipositor tips of *Acauloplacella* species. **A**, *A. (A.) queenslandica* Rentz, Su, Ueshima **sp. nov.** **B**, *A. (A.) incisa* Rentz, Su, Ueshima **sp. nov.** Note similarity with *A. (A.) queenslandica*. **C**, *A. (A.) hasenpuschae* Rentz, Su, Ueshima **sp. nov.**



**FIGURE 7.** Calling song of paratopotype of *Acauloplacella (A.) queenslandica* Rentz, Su, Ueshima **sp. nov.** Horizontal axis is time in seconds.



**FIGURE 8.** Scanning electron micrographs of *Acauloplacella* (*A.*) *hasenpuschae* Rentz, Su, Ueshima **sp. nov.** Apex of abdomen, paratopotypic male. **A**, lateral view, note subgenital plate and short, stout cercus. **B**, dorsal view. Note elongate supra-anal plate and short, cylindrical cerci, the internal tooth of each is concealed by supra-anal plate. Note the inflated, scoop-shaped styles of the subgenital plate. **C**, ventral view, note subgenital plate and its median carina. The cerci lie on each side of the subgenital plate. **D**, egg, note porous flange that protrudes from crack in bark into which eggs is laid. **E**, magnified portion of flange. Scale for all = 1 mm.

*Abdomen.* Tenth tergite (Fig. 10B, C) with apical margin irregular, not indented; supra-anal plate (Fig. 10B) apex indented. Cercus very elongate, cylindrical, tapering to apex; paraprocts short, stout, directed laterally, appearing to emanate from base of cercus. Titillator (Fig. 10E) with central sclerotised portion a single curing tongue, well sclerotised and carinate dorsally (Fig. 10F). Subgenital plate (Fig. 10C) indented at base, the corners rounded; stalk extraordinarily elongate, with very narrow median incision occupying less than 1/5 of the length of the stalk itself; styles held well above tip of abdomen at rest.

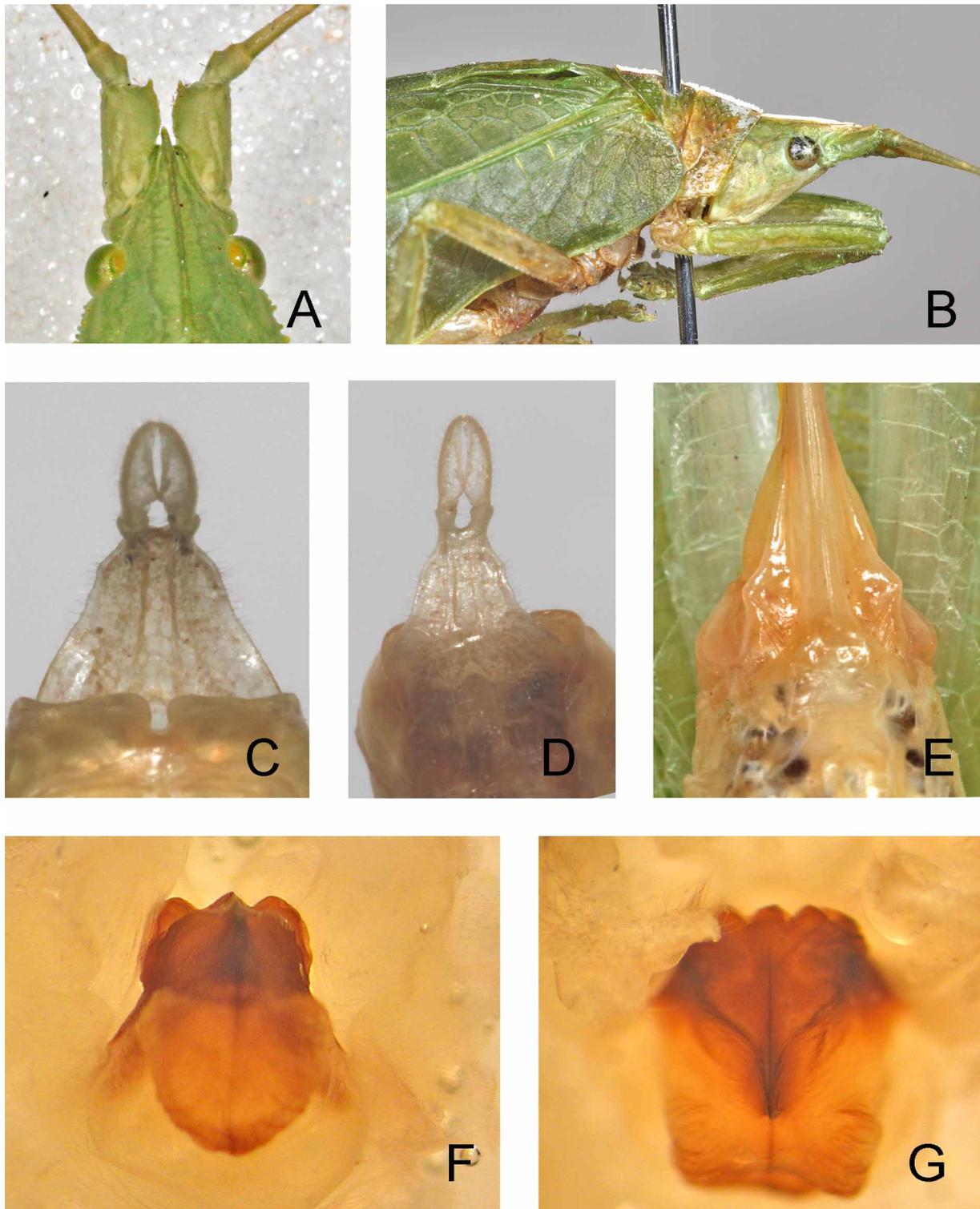
*Female.* Unknown

*Colour.* Colour very pale green; pronotum with metanotum with a small ‘eyespot’ on each side; tegmina with characteristic marks (Fig. 3).

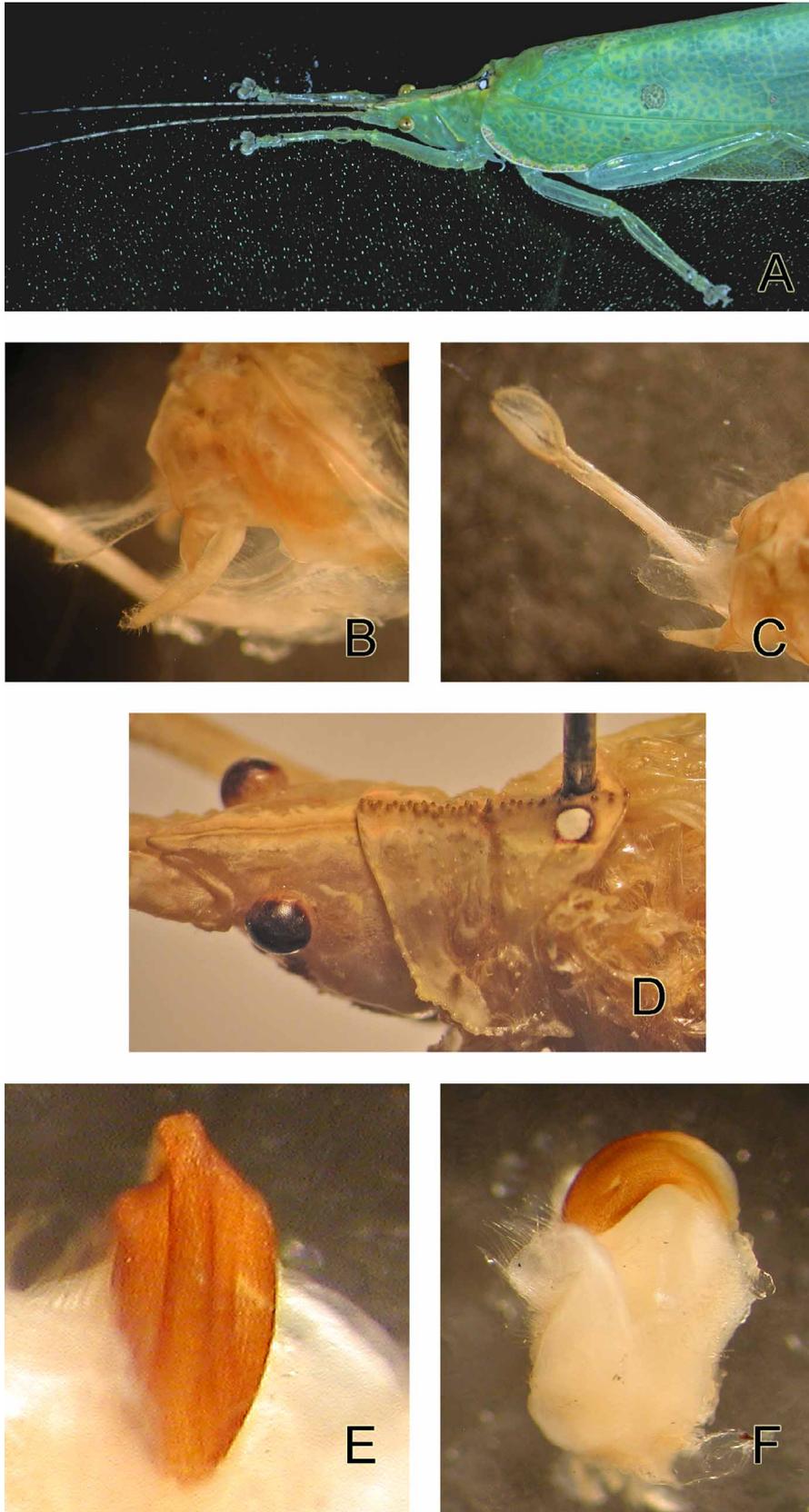
**Specimens examined.** Known only from holotype.

**Comments.** This peculiar species may be associated with mangroves and this may account for its absence from collection due to the “difficulties” that arise from attempting to collect from this habitat in Queensland’s far north. The spots on the pronotum (Fig. 10A, D) are quite distinctive.

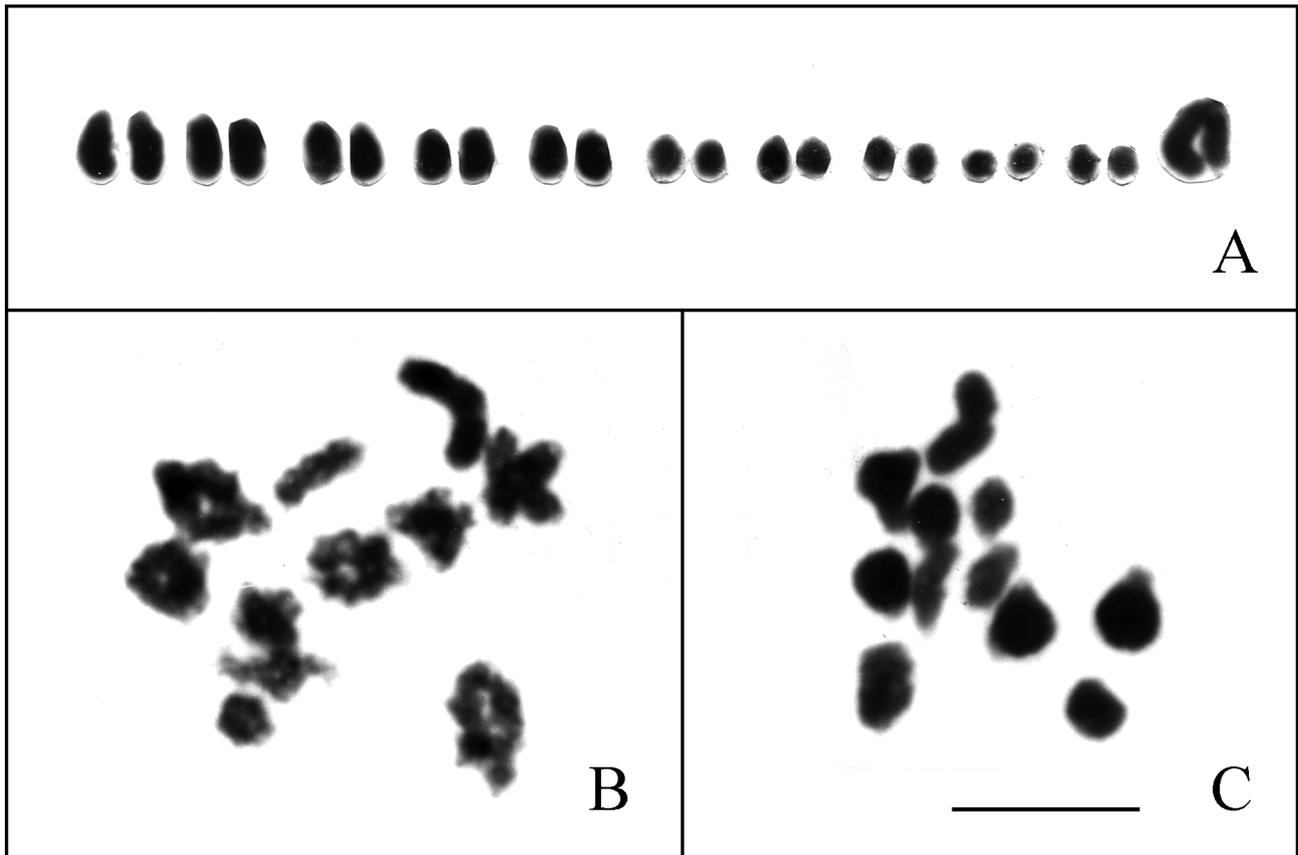
*A. mecyna* is not related to any known Australian species. It shares enough characters to be included in *Papuaprium* but it possesses many that are not seen in the other *Acauloplacella* species.



**FIGURE 9.** Taxonomic characters of *Acauloplacella* (*A.*) *incisa* Rentz, Su, Ueshima **sp. nov.** **A**, head showing spike on antennal scape. This is a rare condition and most specimens usually lack the spikes. **B**, lateral view, head and pronotum. Note tubercles and white stripe. **C**, tip of abdomen, male paratopotype, dorsal view; note median incision and styles of subgenital plate. **D**, tip of abdomen, ventral view, showing details of subgenital plate. **E**, ventral view tip of abdomen, paratopotype female; note tubercles at base of ovipositor and short subgenital plate. **F**, titillator, dorsal view; note setae on dorsal margin. **G**, titillator, ventral view.



**FIGURE 10.** *Acauloplacella (A.) mecyna* Rentz, Su, Ueshima *sp. nov.* **A**, holotype male; note dark spot and markings along costal margin of tegmen. Note also spots on each side of pronotum. **B**, tip of abdomen showing elongated supra-anal plate resting on base of subgenital plate. Note also stout structure from base of cercus that is probably a paraproct. **C**, tip of abdomen showing elongate subgenital plate. Note cup-shaped styles. **D**, head and pronotum; note line of tubercles and dentate ventral margin. **E**, titillator, dorsal view. **F**, titillator, lateral view. Note setae on fleshy lobes.



**FIGURE 11.** *Acauloplacella (A.) queenslandica* Rentz, Su, Ueshima **sp. nov.** **A**, karyotype; **B**, diakinesis; **C**, first metaphase.

#### **Cytological Observations of the Pseudophyllinae and *Acauloplacella* in particular**

Despite more than 1000 species being included in the Pseudophyllinae, only eight have been examined cytologically. The diploid numbers for these eight ranged from 31 to 35 with XO system, Hewitt (1979), Rentz, *et al.* (2005).

Only one Australian species was examined in this study. The chromosome system in *A. (A.) queenslandica* (sample 86–101),  $2n=21$  ( $20t+Xm$ ) is represented by 10 pairs of medium to small telocentric autosomes and a large metacentric X (Fig. 11A). At diakinesis there are 10 autosomal entities and a heterochromatic X (Fig. 11B). First metaphase reveals 10 autosomal bivalents and the X (Fig. 11C). This result is somewhat surprising and suggests that further study of species of Phyllomimini is needed to elucidate the phylogenetic relations between it and other pseudophylline tribes.

#### **Acknowledgements**

Jack & Sue Hasenpusch are thanked for specimens sent over the years. Mr G. W. Wilson and Drs P. Naskrecki and D. B. Weissman kindly made suggestions that improved the manuscript. Piotr suggested examining the right tegmen of males for additional taxonomic characters and he has been proved correct. Mr Eric Hines, CSIRO Entomology, Canberra provided the scanning electron micrographs of the eggs. Dr Marianne Horak is thanked for aiding in the translation of Beier's key.

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