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## ***Inflatopyga*, a New Cicada Genus (Homoptera : Cicadoidea : Cicadidae) Endemic to the Solomon Islands**

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### *Abstract*

The new cicada genus *Inflatopyga* and six new species of this genus are described from the Solomon Islands. The genus belongs to the subtribe *Cosmopsaltriaria* of the tribe *Dundubiini* (family *Cicadidae*). The species are mainly island endemics. *Inflatopyga boulardi*, sp. nov., *I. ewarti*, sp. nov., and *I. verlaani*, sp. nov., are endemic to Bougainville, *I. langeraki*, sp. nov. (type species), is endemic to Guadalcanal and New Georgia, *I. webbi*, sp. nov., to Santa Isabel and *I. mouldsi*, sp. nov., to Malaita. A key to the males is provided. *Inflatopyga* is the sister-genus of *Rhadinopyga*, while both genera together are considered to be the sister-group of *Diceropyga*. A cladogram showing the apomorphies suggests the monophyletic origin of the genera and the genus relationships. The biogeography of the cicadas of the Solomon Islands is discussed. The distribution and monophyly of *Inflatopyga* suggest that the Solomon Islands form an area of endemism.

### **Introduction**

Some specimens of a new genus from the Solomon Islands were discovered more than ten years ago. Despite a search for more material in many museum collections, the total number of the genus remained relatively small. Finally, I have now decided to describe the genus *Inflatopyga* and six new species of this genus, which are all endemic to the Solomon Islands. This paper forms part of a systematic and biogeographic study of the subtribe *Cosmopsaltriaria* of the tribe *Dundubiini*. The *Cosmopsaltriaria* are distributed from Sulawesi throughout the Papuan subregion and the islands of the West Pacific to Western Samoa (Duffels 1986, 1988, 1990, 1993). At present the subtribe *Cosmopsaltriaria* contains 125 species attributed to eight genera: *Aceropyga* Duffels, *Brachylobopyga* Duffels, *Cosmopsaltria* Stål, *Diceropyga* Stål, *Dilobopyga* Stål, *Moana* Myers, *Rhadinopyga* Duffels, and *Inflatopyga* described here. The genera and species of the *Cosmopsaltriaria* show a high degree of endemism and are therefore very suited for the recognition of areas of endemism and the study of historical biogeographic patterns (Duffels and de Boer 1990; de Boer 1995; de Boer and Duffels 1996).

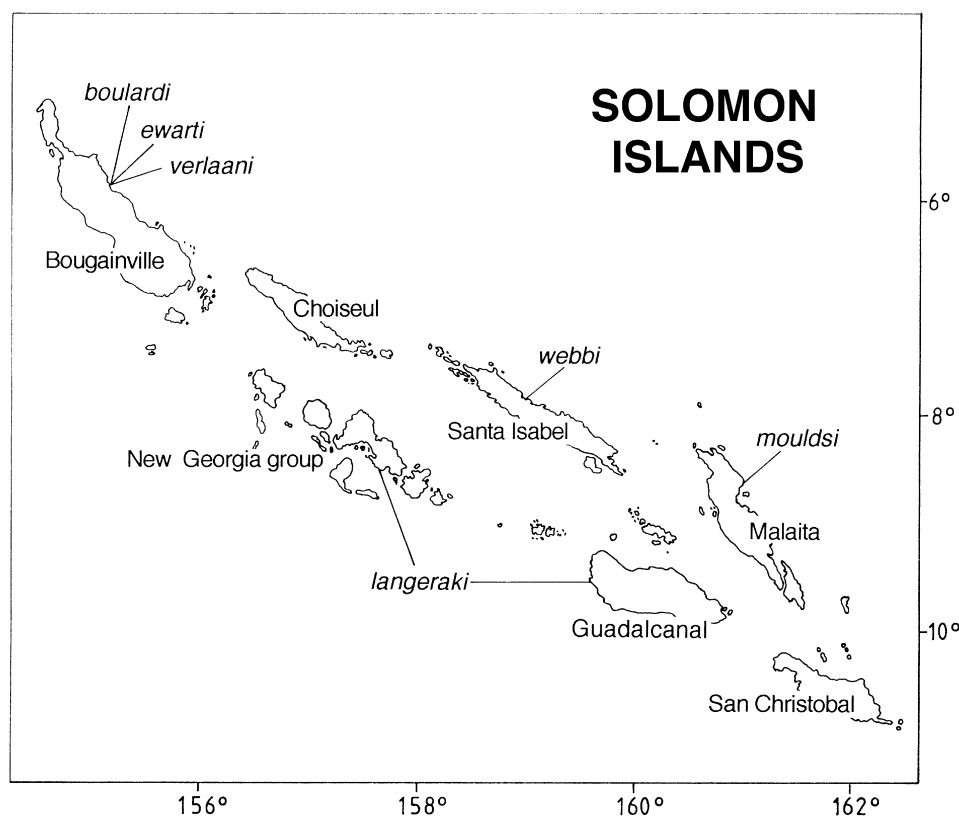
### **Material**

Material examined for this study is preserved in the following collections:

AMS	Australian Museum, Sydney
ANIC	Australian National Insect Collection, Canberra
BMNH	Natural History Museum (formerly British Museum of Natural History), London
BPBM	Bernice P. Bishop Museum, Honolulu
CAS	California Academy of Sciences, Department of Entomology, San Francisco
SMTD	Staatliches Museum für Tierkunde, Dresden
TMB	Természettudományi Múzeum, Budapest
	Collection M. S. Moulds, Sydney

Genus *Inflatopyga*, gen. nov.Type species: *Inflatopyga langeraki*.*Description*

Postclypeus weakly produced; from ventral aspect with transverse ridges ending laterally in a file of 1–4 short, irregularly knobby cross-ridges. Lateral margin of pronotum ampliate and provided with weak tooth. Pronotum as broad as, or slightly broader than, head. Mesonotum slightly narrower than head. Male operculum more or less triangular, short, not reaching beyond posterior margin of abdominal segment 3 (Figs 8, 15, 17). Tegmina and wings hyaline. Tegmen with basal veins of 1st, 2nd, 3rd and often 5th apical areas of tegmen infuscated, and with very faint, light-brownish spots at apices of longitudinal veins of apical areas. Male abdomen more or less parallel-sided (Figs 4, 14), the segments 2–6 being about equally wide. Dorsal marking on abdomen inconspicuous. Timbal covering fairly small, triangular, rounded apically, covering only a part of the timbal cavity (Figs 15, 17). Male pygofer with well-developed lateral processes; the processes are broadened in ventral view, as if inflated (Figs 3, 5, 9, 16, 29, 35), and in lateral view very narrow and slightly upcurved apically (Figs 10, 31, 36). Basal pygofer lobes forming cup of pygofer with a narrow ridge (Figs 3, 5, 9, 16, 29, 35). Uncus with broad, triangular, apically bilobate, median lobe, and weakly developed rounded lateral lobes (Figs 12, 30, 38). Claspers with 1 or 2 spines (Figs 3, 6, 11, 18–23, 32, 35). Aedeagus with fairly large and swollen basal lobes; apex of aedeagus with a subapical dorsal spine and two movable apical spines, next to each other: a very short and stout spine and a long and slender spine (Figs 24–28).



**Fig. 1.** Distribution of the species of *Inflatopyga*.

### Phylogeny

A preliminary cladogram of the genera of the subtribe Cosmopsaltriaria has been produced recently, in connection with a more detailed phylogenetic analysis of the systematic position of the Samoan cicadan species *Moana expansa* (Duffels 1993). A cladistic analysis of the Cosmopsaltriaria as a whole is in preparation. The data used in the following discussions on the monophyly of *Inflatopyga* and the phylogenetic relationships of this genus are extracted from this analysis, which includes all species of the subtribe. The Cosmopsaltriaria as a whole are supposed to form a monophyletic group; the presence of lateral processes of the male pygofer is regarded as a synapomorphy for the species of the subtribe.

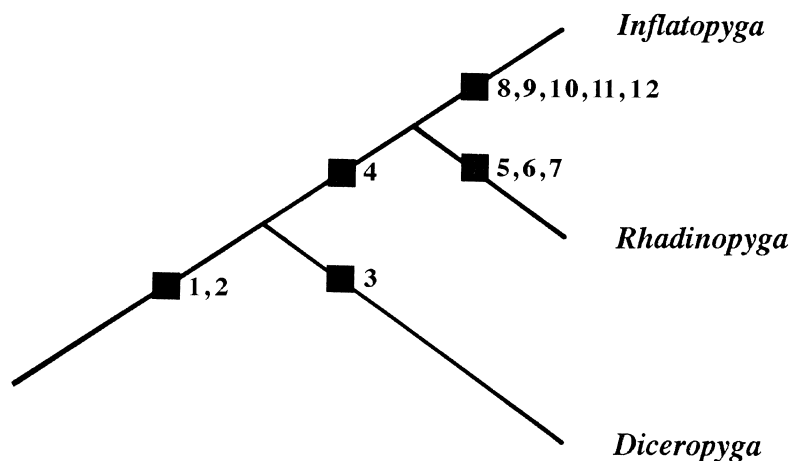
#### Monophyly of *Inflatopyga*

The genus *Inflatopyga* as proposed here is a very homogeneous group of species. The six species share several apomorphies, which demonstrate the monophyly of the genus in a very convincing way (Fig. 2). The supposed synapomorphies are as follows: the (in ventral view) broadened and seemingly inflated lateral processes of the male pygofer (character 8 in Fig. 2); the broad, triangular, median lobe of the uncus (character 9); the weakly developed file of 1–4 short, cross-ridges at the lateral ends of the transverse ridges on the underside of postclypeus (character 10; compare also character 1 in the next paragraph on relationships to other genera); the infuscated basal vein of the 1st apical area of the tegmen (character 11); the more or less parallel-sided male abdomen which is about equally wide from segments 2 to 6 (character 12).

#### Relationships to Other Genera

*Inflatopyga* is hereby considered to be the sister-genus of *Rhadinopyga* Duffels. One synapomorphy, the (in lateral view) very narrow and apically slightly upcurved lateral process of the pygofer (character 4), suggests the monophyly of *Inflatopyga* and *Rhadinopyga*. The monophyletic origin of the species of *Rhadinopyga* is sustained by three synapomorphies: the broad and shallow cup of the pygofer (character 5), the straight and parallel ridges of the basal pygofer lobes (character 6), and the chitinised, more or less suddenly tapering, apical part of the aedeagus (character 7).

*Inflatopyga* and *Rhadinopyga* together form the supposed sister-group of *Diceropyga*. The monophyly of this group of three genera is sustained by the following synapomorphies: underside of postclypeus with strongly developed file of 4–7 short, cross-ridges at lateral ends of transverse ridges (character 1; compare also character 10 of *Inflatopyga*), and the presence of relatively small lateral uncus lobes (character 2). The monophyletic origin of the species of *Diceropyga* is suggested by paired appendages of the pygofer (character 3).



**Fig. 2.** Cladogram for the genera *Inflatopyga*, *Rhadinopyga* and *Diceropyga*. The numbers refer to apomorphic characters discussed above.

The genera *Inflatopyga*, *Rhadinopyga* and *Diceropyga* form the sister-group of the genera *Aceropyga* and *Moana*. *Cosmopsaltria* is the sister-genus of the five genera mentioned, while *Dilobopyga* and *Brachylobopyga* form the sister-group of all other genera of the subtribe.

Because the species of *Inflatopyga* are very much alike, it is very difficult to establish the infrageneric phylogenetic relationships in this genus.

### Biogeography

A total of 31 cicada species has been recorded from the Solomon Islands. Thirty species are endemic to the archipelago, and most of them are endemics of one island or a group of islands. *Heteropsaltria* Jacobi (one species) and *Nggeliana* Boulard (two species) are up to now the only cicada genera recorded as endemic to the Solomon Islands. These two genera are closely related and probably sister-taxa. *Heteropsaltria aliena* Jacobi is endemic to Bougainville. *Nggeliana typica* Boulard is endemic to Guadalcanal, and *N. leveri* Boulard is endemic to Florida Island north of Guadalcanal I. (Boulard 1979; Duffels).

The genus *Inflatopyga*, with six species, is the largest monophyletic group of cicadas recorded as endemic to the Solomon Islands. Three species of *Inflatopyga* are endemic to Bougainville, one species is endemic to Santa Isabel, one to Malaita, and one to Guadalcanal and New Georgia. The distribution of *Inflatopyga* over most of the Solomon Islands suggests that this archipelago must be regarded as an area of endemism. The sister-group relationship of *Inflatopyga* and *Rhadinopyga* from the Birds Head of New Guinea suggests an historic sister-area relationship between the Solomon Islands and the Birds Head. The biogeography of the subtribe *Cosmopsaltriaria* is discussed at length elsewhere in more general papers on the historic biogeography of the Indo-Pacific cicadas (de Boer 1995; de Boer and Duffels 1996).

Apart from the species belonging to endemic genera, two monophyletic species-groups of cicadas, the *Diceropyga subapicalis* group and the *Baeturia bloetei* group, show considerable speciation in the Solomon Islands. The *Diceropyga subapicalis* group contains 17 (sub)species and is represented in the Solomon Islands by eight single-island endemics (Duffels 1977; Duffels and de Boer 1990). These eight species might form a monophyletic group together with two undescribed species from respectively Biak and Numfor Island (Duffels, unpublished data). The remaining species of the *Diceropyga subapicalis* group are found in New Guinea and the Bismarck Archipelago, while the two other species groups of *Diceropyga*, the *D. obtecta* group (4 species) and the *D. obliterans* group (4 species), are endemic to Maluku and the Bismarck Archipelago, respectively. The *Baeturia bloetei* group contains 18 species and has 8 endemic species in the Solomon Islands, most of which occur in small groups of islands (de Boer 1989; Duffels and de Boer 1990). The Solomon species of the *Baeturia bloetei* group belong to two monophyletic subgroups. One shows a relationship with species from Vanuatu, Tonga and Samoa, the other subgroup shows relationship with species from northern Vanuatu, Rotuma I. and northern New Guinea.

The other endemic cicadas recorded from the Solomon Islands are *Moana aluana* (Distant) with three subspecies in various islands (Duffels 1977, 1993), *Lyristes cristobalensis* Boulard (Boulard 1990) and *Toxopeusella browni* Boulard (Boulard 1981). The only non-endemic Solomon species, *Thaumastopsaltria spelunca* de Boer, is also recorded from the Papuan Peninsula and the Bismarck Archipelago (de Boer 1992).

### Identification

The most distinctive characters separating the species of *Inflatopyga* are found in the structure of the genitalia and the opercula of males. In the key given below a very restricted use is made of body colour and patterns, because it is difficult to decide whether those features are really species-specific or due to individual variation, especially in the species described from a single specimen.

**Key to Males of *Inflatopyga***

1. Lateral margin of operculum along its whole length nearly straight or convex, not concave (Figs 13, 37) ..... 2
- Lateral margin of operculum in basal part convex, and more or less concave at 3/4 or 4/5 of its length from base (Figs 8, 15, 17, 34) ..... 3
- 2 (1). Medial spine of clasper about half as long as lateral spine (Figs 9, 11). Bougainville I. .... *Inflatopyga verlaani*
- Medial spine of clasper nearly as long as lateral spine (Fig. 35). Malaita I. .... *Inflatopyga mouldsi*
- 3 (1). Clasper with medial spine, and lateral spine very short or absent (Figs 3, 5–7) ..... 4
- Clasper with medial spine and strongly developed lateral spine, which is apically more or less curved inwards toward medial spine (Figs 11, 18–23, 32, 35) ..... 5
- 4 (3). Clasper with fairly long, medial spine and small lateral spine (Fig. 3). Lateral margin of operculum distinctly concave at 3/4 of its length from base. Bougainville I. .... *Inflatopyga boulardi*
- Clasper with very long, medial spine making a complete loop, but missing lateral spine (Figs 5–7). Lateral margin of operculum weakly concave at 4/5 of its length from base (Fig. 8). Bougainville I. .... *Inflatopyga ewarti*
- 5 (3). Head from dorsal aspect with large brown to dark-brown trapezoid spot enclosing ocelli and reaching from just below paired ocelli nearly to anterior margin of head (Fig. 33). Operculum (Fig. 34) reaching to 1/6 of length of abdominal segment 3. Santa Isabel I. .... *Inflatopyga webbi*
- Head from dorsal aspect with brownish black trilobate spot enclosing ocelli. Operculum (Figs 15, 17) reaching to 1/3 or half length abdominal segment 3. Guadalcanal I. .... *Inflatopyga langeraki*

***Inflatopyga boulardi*, sp. nov.**

(Figs 1, 3, 4)

**Material Examined**

*Holotype*. ♂, "Bougainville: NE / Mutahi. 700 m / 18km S. E. Tinputz", "8–14.iii.1968", "Tawi / collector / BISHOP", BPBM.

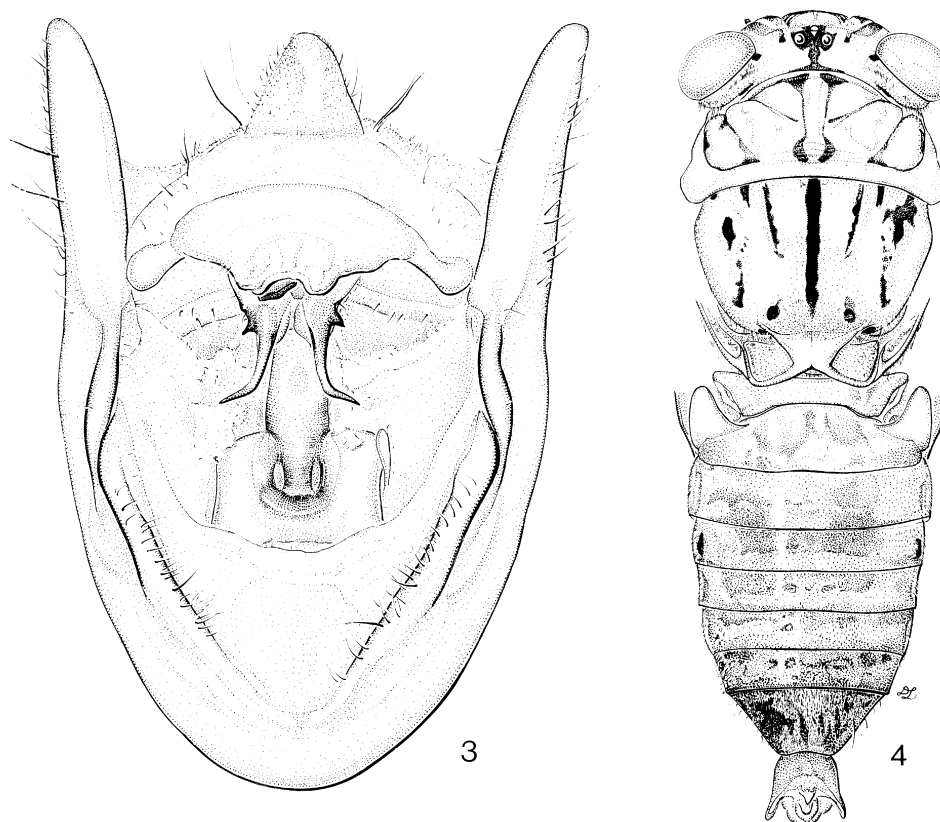
**Description of Male**

Ground colour of body pale brown.

*Head*. Head from dorsal aspect with brownish black trefoil-shaped spot enclosing ocelli; a brownish median line extending from this spot to a brownish line along the middle part of hind margin of head; a pair of small brown spots between paired ocelli and eyes, and a pair of small, quadrangular, black-brown spots at inner margins of eyes. Vertex lobes with brownish suffusion. Supra-antennal plates with dark-brown spot. Anterior part of postclypeus with a series of four brownish transverse lines on either side; medial ends of these lines connected by an arcuate line. Anteclypeus unmarked. Rostrum black-brown apically; extending beyond hind coxae.

*Thorax*. Fasciae on thorax brownish to black. *Pronotum*. Paired central fasciae continuous and very narrow in between, each anteriorly dilated at margin of pronotum and posteriorly crescentic. A pair of very narrow brown lines parallel with, and mesad of, posterior parts of anterior oblique fissures. Posterior parts of posterior oblique fissures and lateral parts of ambient fissure brownish.

*Mesonotum*. Median fascia fairly broad, equally wide along its whole length and reaching from anterior mesonotal margin nearly to cruciform elevation. Paramedian fasciae narrow, slightly curved mesad, and reaching from anterior mesonotal margin to half length of mesonotum. A pair of brownish black, oval, spots in front of anterior branches of cruciform elevation. A pair of short brown streaks at anterior mesonotal margin lateral of paramedian fasciae. Lateral fasciae broken up into a very small spot at anterior mesonotum margin, a second,



**Figs 3, 4.** *Inflatopyga boulandi*, holotype. 3, Male pygofer in ventral view; 4, body in dorsal view.

somewhat larger spot at 1/3 of mesonotum length from anterior margin, and a narrow line that widens distally on posterior half of mesonotum.

*Legs.* Pale brown. Fore femora with dark-brown marks on inner and outer sides, and two semi-erect brownish spines. Innerside of middle femora with brownish streak. Fore and middle tibiae subapically slightly more brownish. Pretarsus of middle legs dark brown (tarsi of fore legs missing).

*Tegmina and wings.* Tegmen with basal veins of 1st, 2nd and 3rd apical areas lightly infuscated, and with tiny fuscous spots at apices of longitudinal veins of 1st to 6th apical areas. Basal venation of tegmen yellowish brown variegated with black-brown, apical venation dark brown. Venation of wing light brown, marginal vein dark brown.

*Operculum.* Pale brown, fairly short, nearly reaching hind margin of abdominal segment 3. Surface rather flat, but laterodistal part slightly convex. Medial margin slightly convex basally, very weakly concave at about midlength and slightly convex apically. Lateral margin fairly convex in basal part, and distinctly concave at 3/4 of its length from base; apical margin of operculum rounded.

*Abdomen.* Timbal covering triangular with broad rounded apex, straight lateral margin and weakly concave medial margin. Abdomen dorsally with small, light-brown, median spot at anterior margin of segment 2, a light-brownish suffusion on medial parts of segments 3 and 4, and a pair of dark-brown lateral spots on segment 4. Segments 7 and 8 dorsally and ventrally dark brown.

*Genitalia* (Fig. 3). Pygofer and medial uncus lobe as in Fig. 3. Clasper (Fig. 3) with fairly broad basal part that gradually narrows in a fairly long, curved spine (this spine is supposed to

be homologous with the medial spine of *Inflatopyga verlaani*, *I. langeraki*, *I. webbi* and *I. mouldsi*); basal part of clasper with a small lateral spine. Apical part of aedeagus missing.

*Measurements*

Body length 23.5 mm; head width 7.8 mm; pronotum width 7.8 mm; tegmen length 31.5 mm.

*Etymology*

This species is named after Dr Michel Boulard, École pratique des hautes Études et Muséum national d'Histoire Naturelle, Paris, who contributed so much to the study of cicadas.

***Inflatopyga ewarti***, sp. nov.

(Figs 1, 5–8)

*Material Examined*

*Holotype*. ♂, "Piva Riva / Emp. Augusta Bay / Bougainville / Solomon Is. / Nov. 1945 / E. D. Watson", AMS.

*Paratype*. **Solomon Islands:** Bougainville, Dec. [19]44, A. J. Walz, 1♂ (missing both tegmina and greatest part of left wing), CAS.

*Description of Male*

Ground colour of body pale brown.

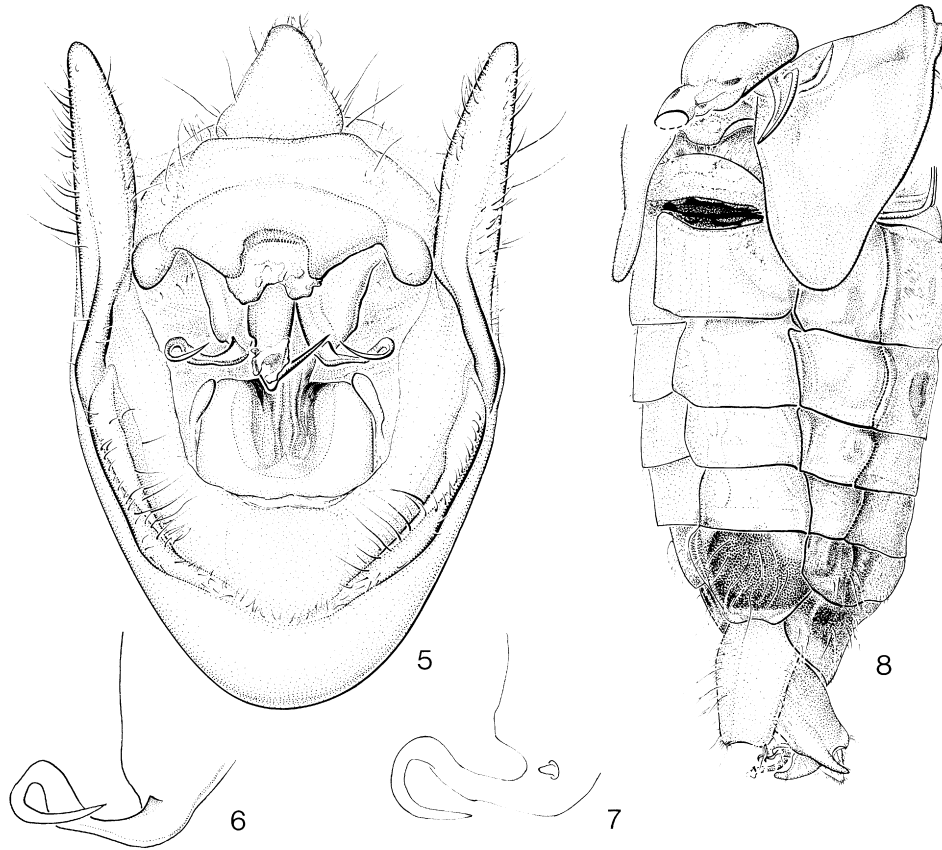
*Head*. Head from dorsal aspect with brownish black trefoil-shaped spot, enclosing ocelli and narrowing proximad to hind margin of head, a pair of black-brown spots between ocelli and eyes, and a pair of brownish black spots at inner margins of eyes. Vertex lobes brownish suffused in paratype only. Supra-antennal plates for the greater part black-brown. Anterior part of postclypeus with 4–5 brownish (in holotype) to brownish black (in paratype) transverse lines on either side; median ends of these lines in the paratype connected by an arcuate line. Paratype additionally with short median stripe, and some transverse lateral marks in lower half of postclypeus. Anteclypeus unmarked. Rostrum black-brown apically; extending beyond hind coxae.

*Thorax*. Fasciae on thorax black-brown. *Pronotum*. Paired central fasciae continuous, diverging forward and fused in short, broad fascia along middle part of anterior pronotal margin, posteriorly crescentic, and very narrow in between. A pair of very narrow, light-brownish lines parallel with, and mesad of, posterior part of anterior oblique fissures. Posterior oblique fissures and lateral parts of ambient fissure black-brown. Paratype with pair of curved, brownish marks between pairs of oblique fissures.

*Mesonotum*. Median fascia fairly broad, equally wide along its whole length, and reaching from anterior mesonotal margin nearly to cruciform elevation. Paramedian fasciae as wide as median fascia, slightly curved mesad and reaching from anterior mesonotal margin to half length of mesonotum. A pair of oval, black-brown spots in front of anterior angles of cruciform elevation. A pair of short, brown streaks at anterior mesonotal margin, laterally of paramedian fasciae. Lateral fasciae broken up into a spot at 1/3 of mesonotum length and a fairly slender line on posterior half of mesonotum.

*Legs*. Pale brown. Fore femora with dark-brown marks on inner and outer sides, and with two semi-erect brown spines. Inner side of middle femora with brownish mark. Fore and middle tibiae with broad, subapical, brown ring. Tarsi of fore legs and pretarsus of middle legs dark brown (tarsi of hind legs missing in both specimens).

*Tegmina and wings*. Tegmina with basal veins of 1st, 2nd, 3rd and 5th apical areas lightly infuscated, and with small fuscous spots at apices of longitudinal veins of 1st to 7th apical areas. Venation of tegmen yellowish brown variegated with dark brown. Venation of wing light brown, marginal vein dark brown.



**Figs 5–8.** *Inflatopyga ewarti*. 5, Male pygofer in ventral view, holotype; 6, apical part of clasper, holotype; 7, apical part of clasper, paratype; 8, male abdomen with operculum in ventro-lateral view, holotype.

*Operculum.* Pale brown, fairly short, reaching to  $3/5$  or  $3/4$  of length of abdominal segment 3. Surface nearly flat, but lateral and apical parts weakly convex. Medial margin weakly convex, but in the holotype very weakly concave at midlength. Lateral margin weakly convex in basal part, and weakly concave at  $4/5$  of its length from base. Apical margin of operculum rounded.

*Abdomen.* Timbal covering triangular, rounded apically, lateral and medial margins straight. Segments 2–4 light brownish suffused mid-dorsally. Segments 7 and 8 dorsally and ventrally dark brown.

*Genitalia* (Figs 5–7). Pygofer and median uncus lobe as in Fig. 5. Clasper (Figs 5–7) with broad basal part, that suddenly narrows in a laterally directed, very long and slender spine, that makes a (nearly) complete loop (the angular, lateral margin of the basal part suggests that the long spine of this species is homologous with the medial spine of *Inflatopyga verlaani*, *I. langeraki*, *I. webbi* and *I. mouldsi*, and that the lateral spine, as found in these species, is missing in *I. ewarti*). Paratype with a very short spine on surface of clasper, where the broad basal part narrows to the long spine.

*Measurements*

Body length 23.5–24 mm; head width 7.6–7.9 mm; pronotum width 7.9–8.3 mm; tegmen length 31 mm.

*Etymology*

This species is named after Tony Ewart, University of Queensland, St Lucia, Queensland, geologist by profession and esteemed cicadologist in his spare hours.

***Inflatopyga verlaani*, sp. nov.**

(Figs 1, 9–13)

*Material Examined*

*Holotype*. ♂, “Solomon Islands, / Bougainville, / Buin, 11.i.1970 / James E. Tobler / C. A. S. Colin. “Collection of the / California Academy / of Sciences, San / Francisco, Calif”, CAS.

*Other material examined*. “Shortlands Ins.”, G. Ribbe, 1 ♂, TMB.

*Description of Male Holotype*

Ground colour of body pale brown.

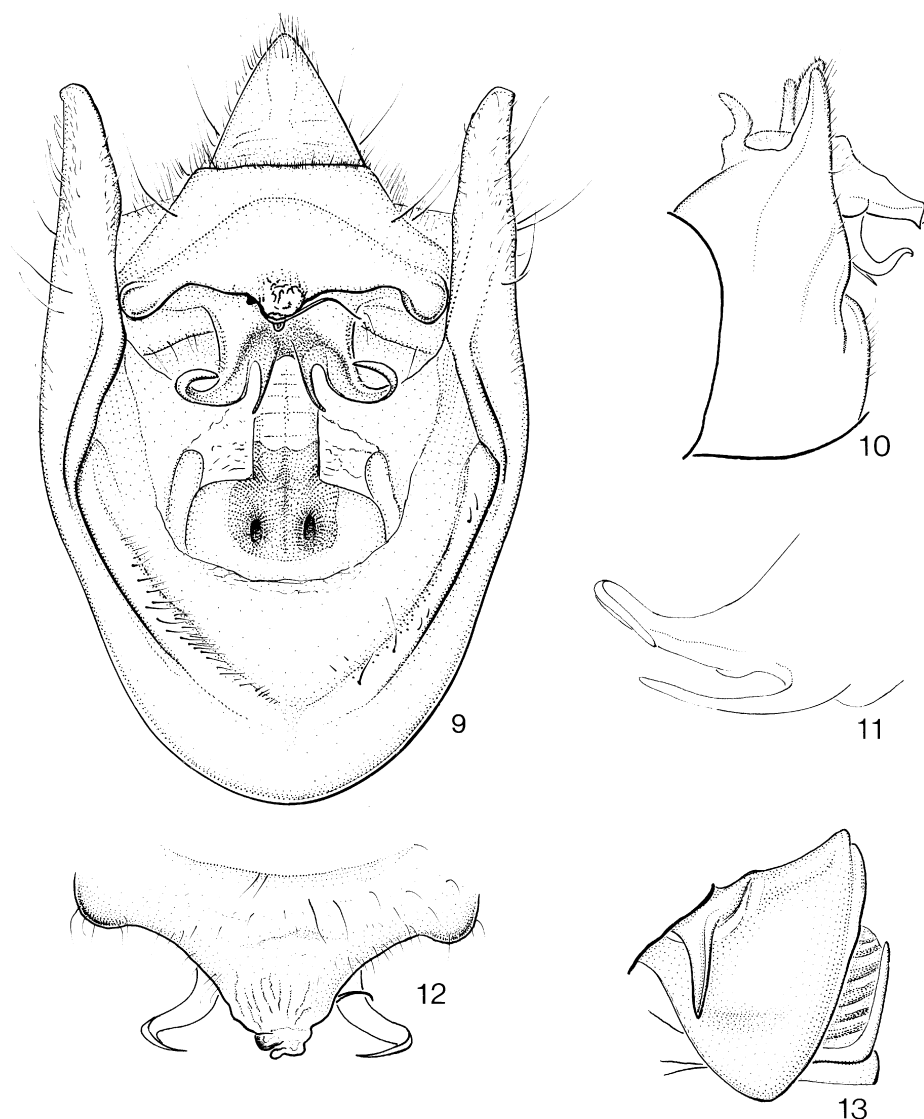
*Head*. Head from dorsal aspect with brownish black trefoil-shaped spot narrowly surrounding ocelli; a brownish line extends from this spot to a brownish line in middle part of hind margin of head; a pair of small black-brown spots between paired ocelli and eyes, and a pair of small quadrangular, black-brown spots at inner margin of eyes. Vertex lobes with irregular brownish suffusion. Supra-antennal plates with fairly large brown spots. Anterior part of postclypeus with a series of three fairly broad, transverse, brown fasciae on either side; medial ends of each series connected. Underside of postclypeus with fairly long, median, brownish line. Anteclypeus with a pair of paramedian brown spots at half length. Rostrum black-brown apically; extending beyond hind coxae.

*Thorax*. Fasciae on thorax black-brown. *Pronotum*. Paired central fasciae narrow anteriorly, posterior halves of fasciae very faint; anterior ends fused in a short, broad fascia along middle part of anterior pronotal margin. A pair of short, brown lines above and parallel to posterior part of anterior oblique fissures, and a pair of brown spots at anterior ends of these fissures. Posterior oblique fissures with irregular, black-brown fasciae. Lateral parts of ambient fissure narrowly brown.

*Mesonotum*. Median fascia fairly broad, nearly equally wide along its whole length, and reaching from anterior mesonotal margin nearly to cruciform elevation. Paramedian fasciae slightly narrower than median fascia, slightly curved mesad, and reaching from anterior mesonotal margin to half length of mesonotum. A pair of black-brown, oval spots in front of anterior branches of cruciform elevation. A pair of short and broad, black-brown streaks at anterior mesonotal margin, lateral of paramedian fasciae. Lateral fasciae broken up into 3–4 black-brown spots at 1/5 of mesonotal length from anterior margin, and a narrow line, which widens distad, on posterior half of mesonotum.

*Legs*. Pale brown. Fore femora with dark-brown marks on inner and outer sides, and with two semi-erect spines. Inner sides of middle and hind femora with fairly broad, brown fascia. Pretarsi of fore and middle legs dark brown.

*Tegmina and wings*. Tegmen with basal veins of 1st, 2nd and 3rd apical areas infuscated and with tiny fuscous spots at apices of longitudinal veins of 1st to 6th apical areas. Basal venation of tegmen light brown variegated with black-brown, apical venation dark brown. Venation of wing light brown, marginal vein dark brown.



**Figs 9–13.** *Inflatopyga verlaani*. 9, Male pygofer in ventral view, holotype; 10, male pygofer in lateral view, holotype; 11, apical part of clasper, Shortlands Is; 12, medial uncus lobe, holotype; 13, male operculum in ventro-lateral view, holotype.

*Operculum* (Fig. 13). Pale brown, very short, reaching to 1/5 of length of abdominal segment 3. Surface very weakly convex. Medial margin weakly convex, lateral margin nearly straight, apical margin broadly rounded.

*Abdomen.* Timbal covering triangular, rounded apically, lateral and medial margins straight. Segments 2–4 dorsally with brownish suffusion in paramedian fields. Segments 5 and 6 dorsally brownish. Segments 7 and 8 dorsally and ventrally dark brown.

*Genitalia* (Figs 9–12). Pygofer as in Figs 9 and 10. Medial uncus lobe as in Fig. 12. Clasper (Figs 9, 11) with broad basal part bearing two spines: a strongly laterally curved, fairly long and slender, lateral spine that is apically curved inwards toward medial spine, and an acute, slightly laterally curved, medial spine, which is about half as long as lateral spine.

*Measurements.*

Body length 22 mm; head width 7.4 mm; pronotum width 7.7 mm; tegmen length 30 mm.

*Remarks*

The male specimen from the Shortland Islands, south-east of Bougainville, probably belongs to this species, but the body, and especially the abdomen, is very dark-brown coloured, probably due to improper preservation. The markings on the thorax of the Shortland specimen and the shape of the male operculum are similar to those of the holotype, but the median clasper spine (Fig. 11) is somewhat longer. Body length 22 mm; head width 8.0 mm; pronotum width 8.0 mm; tegmen length 32 mm.

*Etymology*

This species is named after Gerard Verlaan, technician at the Institute of Systematics and Population Biology (Zoological Museum) in Amsterdam, whose help in preparing cicadas for more than 20 years is gratefully acknowledged.

***Inflatopyga langeraki*, sp. nov.**

(Figs 1, 14–28)

*Material Examined*

*Holotype.* ♂, “Honiara / Guadalcanal / 25.x.1963 / R. W. Paine / in forest / 12519”, “gen. et sp. / indet. / M. S. K. Ghauri det. 1965”, BMNH.

*Paratypes.* **Solomon Islands, Guadalcanal:** Betikama R., Sep. 1960, W. W. Brandt, 1 ♀, BPBM; Gold ridge, 500 m, 25.vi.1959, J. L. Gressitt Collector, 1 ♂, BPBM; Lavoro Pltn, C. E. Hart, 1924, K 51927, 1 ♂, 1 ♀, AMS, same data but 1925, K 53974, 1 ♂, AMS, same data but 1925, K 53973, 1 ♀, AMS, same data but 27.ix.1927, K 62269 1 ♂, 1 ♀, AMS, same data but 27.xi.1927, K 62268, 1 ♀, AMS, same data but 21.ix.1932, 164, 1 ♀, AMS; Guadalcanal, 15.i.1944, at light, V. R. Krapp, Purdue University Collection, 1 ♂, BPBM.

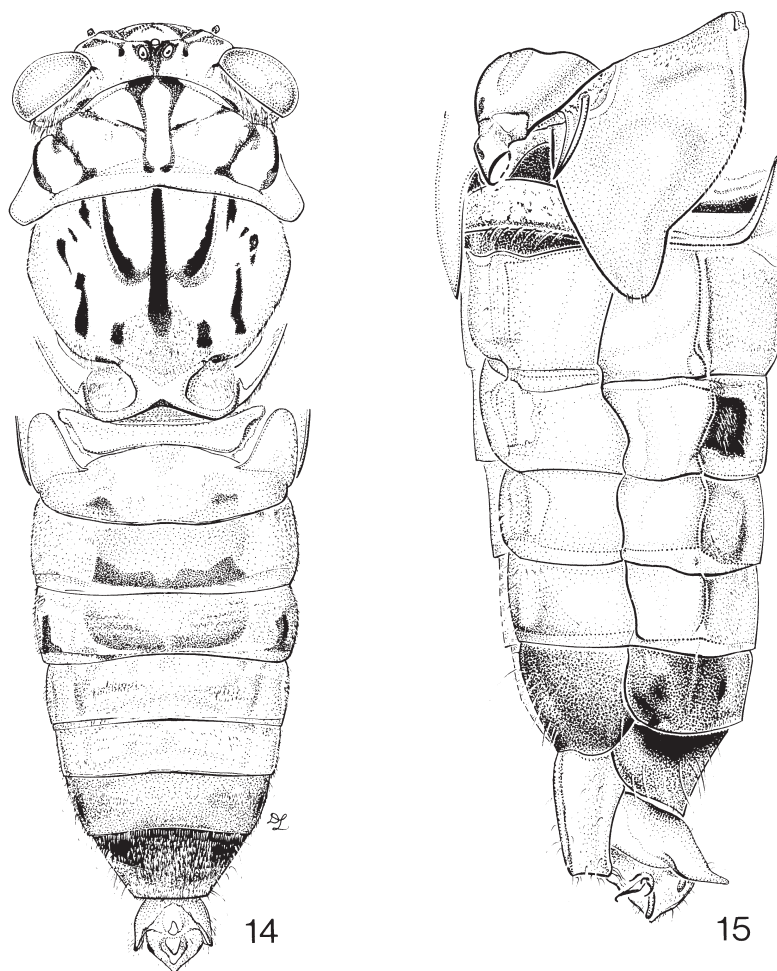
*Other material examined.* **Solomon Islands, Guadalcanal:** Gallego Camp I, 7.vii.1965, 800 ft, felled tree ridge opposite camp, Roy. Soc. Exped., Brit. Mus. 1966–I, 1 ♀, BMNH. **New Georgia group:** Gizo I., 50–120 m, 16–26.iv.1964, J. Sedlacek, Malaise Trap, 1 ♂, BPBM; Neu Georgien, Rubiana, C. Ribbe, 1 ♀, TMB. **Solomon Islands:** “Salomo Ins.” New Guinea, 1916 1, coll. A. Jacobi, 3 ♂, SMTD; Ins. Salomon, 2 ♂, TMB.

*Description**Male*

Ground colour of body pale brown.

*Head.* Head from dorsal aspect with brownish black trilobate spot enclosing ocelli; a pair of small dark-brown spots between paired ocelli and eyes, and a pair of small, dark-brown spots at inner margin of eyes. Vertex lobes with brownish suffusion. Supra-antennal plates with very light brownish to black-brown spot. Anterior part of postclypeus with a series of 4–5 brown to black-brown, transverse lines on either side; medial ends of these lines fused into a complete oval ring or an arcuate line with open lower side. Lower part of postclypeus with traces of a median, brownish line and a series of three short, transverse, brown lines on either side. Anteclypeus with distinct transverse brown stripe, or a pair of brown spots at half length. Rostrum black-brown apically; extending beyond hind coxae.

*Thorax.* Fasciae on thorax black-brown. *Pronotum.* Paired central fasciae diverging and very narrow in between; each fascia strongly dilated toward anterior pronotal margin and crescentic posteriorly. A pair of narrow, brown lines, parallel with, and mesad of, posterior parts of anterior oblique fissures, mostly connected with central fasciae. Some specimens with pair of light-brown spots at anterior end of anterior oblique fissures, posterior oblique fissures and lateral parts of ambient fissure black-brown.

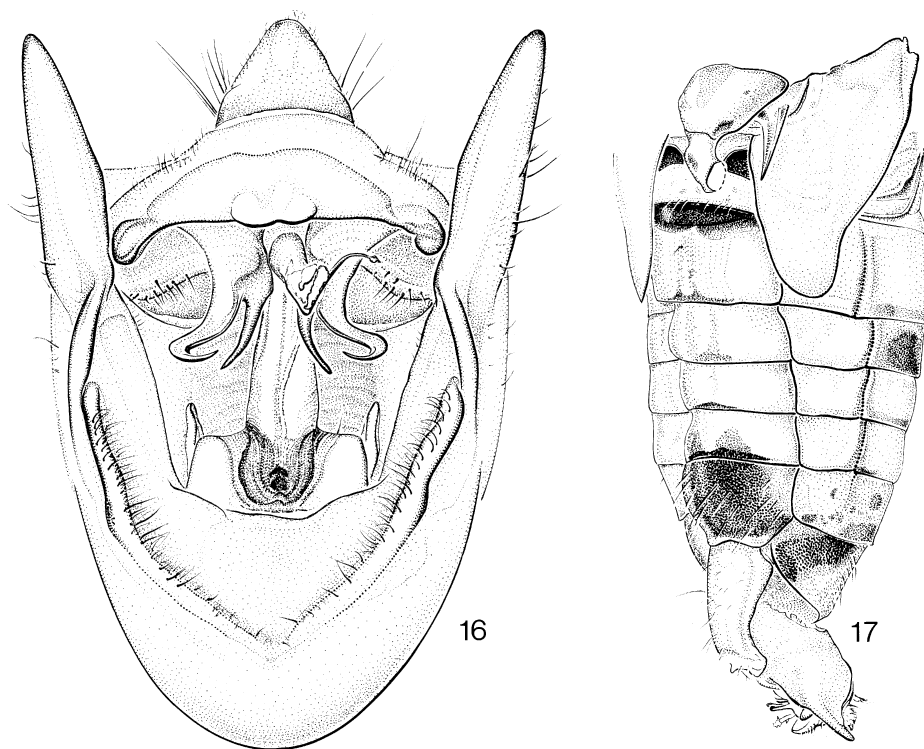


**Figs 14, 15.** *Inflatopyga langeraki*, holotype male. 14, Body in dorsal view; 15, abdomen with operculum in ventro-lateral view.

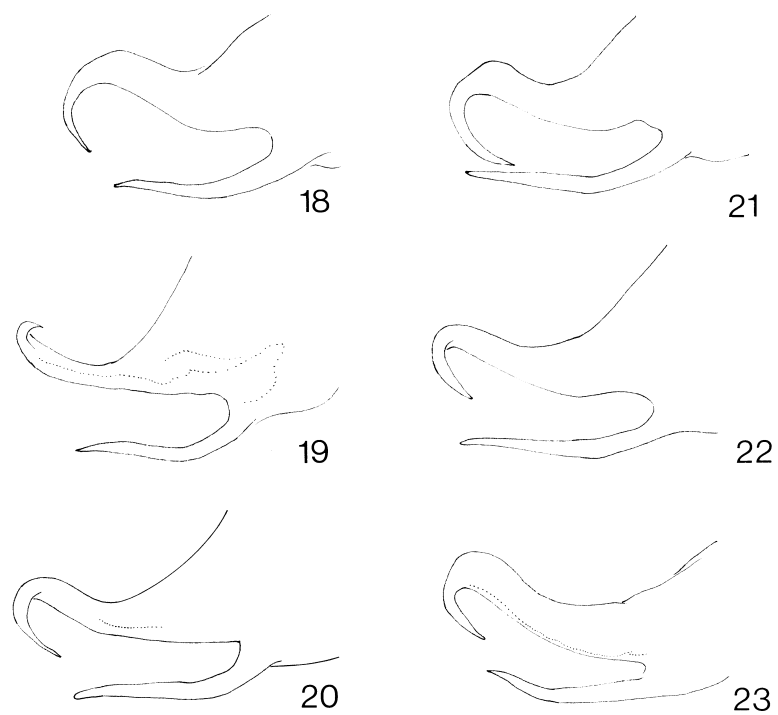
*Mesonotum.* Median fascia fairly broad, about equally wide along its whole length, although sometimes slightly widened distally, and reaching from anterior mesonotal margin to 4/5 of mesonotum length. Paramedian fasciae slightly curved mesad, and reaching from anterior mesonotal margin to half length mesonotum; paramedian fasciae anteriorly narrower than median fascia, and widened distally to 1–1.5× the width of median fascia. A pair of oval brown spots in front of anterior angles of cruciform elevation. A pair of short, brown streaks at anterior mesonotal margin, laterally of paramedian fasciae. Lateral fasciae broken up into 1–2 spots on anterior half of mesonotum and a line on posterior half of mesonotum.

*Legs.* Pale brown. Fore femora with two narrow brown, distally connected, lines on innerside, a broad brown fascia on upperside, which is connected with a fairly large brown, distal spot on outer side. Inner side of middle femora with brown mark. Underside of hind femora distally brown. Fore and middle tibiae with fairly broad, subapical, brown ring. Tarsi of fore legs dark brown.

*Tegmina and wings.* Tegmina with basal veins of 1st, 2nd, 3rd and 5th apical areas infuscated, and with very faint, light-brownish spots at apices of longitudinal veins of 1st to 4th apical areas. Basal half of venation of tegmen yellowish brown variegated with black, apical venation dark brown. Venation of wing brown.



**Figs 16, 17.** *Inflatopyga langeraki*, New Georgia. 16, Male pygofer in ventral view; 17, abdomen with operculum in ventro-lateral view.



**Figs 18–23.** *Inflatopyga langeraki*, apical part of clasper. 18, holotype; 19–21, paratypes, Lavoro Plantation, Guadalcanal I.; 22, paratype, Guadalcanal I.; 23, male, New Georgia.

*Operculum* (Fig. 15). Pale brown, fairly short reaching to 1/3 or half length abdominal segment 3. Surface weakly convex. Medial margin basally convex, but otherwise weakly convex or straight. Lateral margin more or less convex in basal part and strongly concave at 3/4 or 4/5 of its length from base; apical part of margin more or less straight to rounded apex.

*Abdomen*. Timbal coverings triangular with broad, rounded apex and (nearly) straight lateral and medial margins. Abdomen, dorsally, with small, brown, median spot at anterior margin of segment 2, light to darker brown, medial suffusions on segments 3 and 4 and dark-brown lateral spots on segment 4. Segments 7 and 8 dorsally and ventrally dark brown.

*Genitalia*. Lateral lobes of pygofer about parallel. Clasper (Figs 18–22) with broad basal part bearing two spines: a laterally curved, long and slender, lateral spine, which is apically semi-circular and curved inwards toward medial spine, and a fairly long and laterally curved, medial spine, which is usually somewhat shorter than the lateral spine. Apex of aedeagus (Figs 24–28) as in the other species of the genus (see genus description).

#### *Female*

Marking on head and thorax as in male, but one specimen (from Lavoro 1925) with a large black-brown spot on lower part of postclypeus instead of transverse brown lines. Tegmina and wings as in male. Operculum reaching posterior margin of abdominal segment 2. Lateral margin oblique and nearly straight, laterodistal angle oblique. Posterior margin weakly undulate. Abdomen dorsally densely covered with silvery hairs; with median, brown line on segment 2 in one specimen only; a pair of small paramedian, brown spots on segment 3; large paramedian, brown marks at hind margins of segments 3 and 4; a pair of distinct, lateral, brown spots on segment 4; and sublateral, brownish marks on segments 5–7. Segments 7 and 8 more or less brownish mid-dorsally. Sternites more or less brownish along anterior margins, sternite 7 brown, medially black-brown. Segment 9 dorsally with a pair of large, brown triangles at anterior margin reaching to half-way or 2/3 of its length, and ventrally with a pair of brown marks at 2/3 of length of lower segment margins.

#### *Measurements*

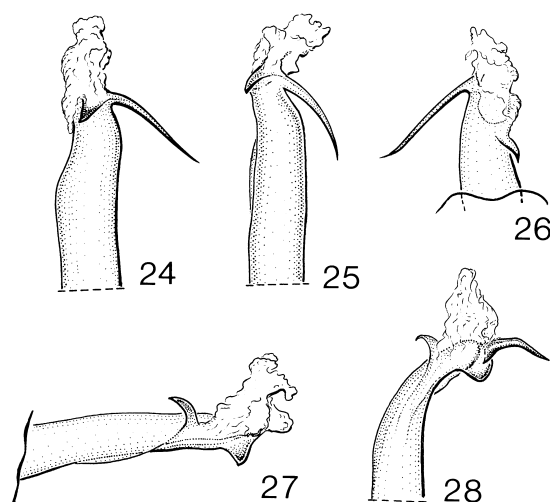
Body length ♂ 21–25 mm, ♀ 20.5–22 mm; head width ♂ 6.9–7.8 mm, ♀ 7.4–8.0 mm; pronotum width ♂ 7.1–8.0 mm, ♀ 7.5–8.3 mm; tegmen length ♂ 28–31.5 mm, ♀ 29.5–31 mm.

#### *Remarks on Other Material*

The female from Guadalcanal, Gallego Camp I, which is not included in the type series, differs from the female paratypes in the following features. Whole body darker brown. Head with larger black median spot enclosing ocelli and with median fascia on underside of postclypeus. Pronotum with fairly broad, irregular, black fascia in posterior oblique fissures and in lateral part of ambient fissure. Mesonotum with fasciae broader than those in the type specimens.

The male specimen from New Georgia (Figs 16, 17, 23), which is not included in the type series, particularly differs from the Guadalcanal type series in length and shape of the male operculum. Its operculum is longer and nearly reaches the posterior margin of abdominal segment 3; the medial operculum margin is weakly convex, and the lateral margin is less concavely bent (at 4/5 of its length from base) than in the type series. Moreover, the New Georgia specimen differs in the lateral lobes of the pygofer which slightly diverge, whilst they are about parallel in the type series, and the distinct, continuous brown median line on the postclypeus.

Five specimens from the 'Solomon Islands', without a more precise locality, are fairly poorly preserved and consequently dull coloured. The fasciae on the mesonotum of these specimens are narrower than in the type series, perhaps due to poor preservation, less strongly curved mesad, and not widened distally. The specimens are very similar to the type specimens in the shape of the operculum and the structure of the male genitalia.



**Figs 24–28.** *Inflatopyga langeraki*, Solomon Is, apical part of aedeagus seen from different sides.

#### Etymology

This species is named after Dick Langerak, artist at the Institute of Systematics and Population Biology (Zoological Museum) in Amsterdam, whose excellent drawings of cicadas form a most essential part of this and other publications. His participation in the study of cicadas is gratefully acknowledged.

#### *Inflatopyga webbi*, sp. nov.

(Figs 1, 29–34)

#### Material Examined

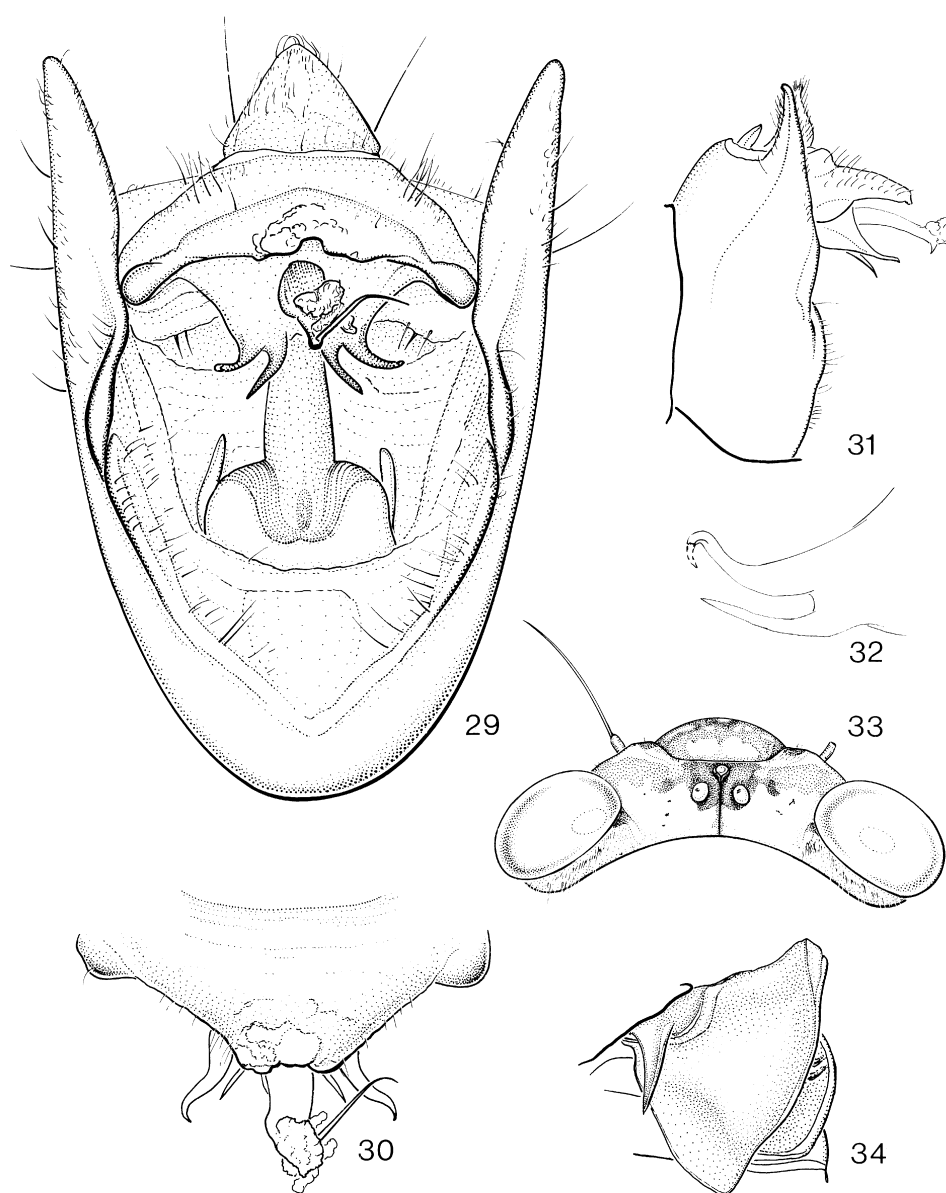
*Holotype*. ♂, "SOLOMON IS. / Isabel / Tatamba / 24.5.1963 / M. McQuillan / 5600", "Gen. et sp. indet. / M. S. K. Ghauri det. 1965", BMNH.

#### Description of Male

Ground colour of body pale brown.

*Head*. Head from dorsal aspect (Fig. 33) with large brown to dark-brown, trapezoid spot enclosing ocelli and reaching from just below paired ocelli nearly to anterior margin of head; a faint, brownish line extends from this spot to posterior margin of head. Vertex lobes with large, light-brownish mark, enclosing two dark-brown spots between ocelli and eyes. Supra-antennal plates with round dark-brown spot. Postclypeus with irregular, broad, brown fascia along anterior margin. Anterior part of postclypeus with a series of four fairly broad, transverse, brown fasciae on either side; medial ends of upper three transverse fasciae of both series connected in median, oval figure, which is open at its lower end. Lower part of postclypeus with a series of three short and broad, brown, transverse lines on either side. A median, brown line extends from median oval figure nearly to clypeal suture. Anteclypeus with pair of paramedian brown spots at half length. Rostrum black-brown apically; extending beyond hind coxae.

*Thorax*. Fasciae on thorax brown to black-brown. *Pronotum*. Paired central fasciae continuous and narrow in between; each fascia strongly dilated towards anterior pronotum margin and crescentic in posterior 1/4. A pair of very light-brown spots at anterior ends of anterior oblique fissures. A pair of light-brown spots between both pairs of oblique fissures. Posterior oblique fissures with irregular, broad, brown fasciae. Lateral part of ambient fissure brown.



**Figs 29–34.** *Inflatopyga webbi*, holotype male. 29, Pygofer in ventral view; 30, medial uncus lobe in ventral view; 31, pygofer in lateral view; 32, apical part of clasper; 33, head in dorsal view; 34, operculum in ventro-lateral view.

*Mesonotum.* Median fascia fairly broad, about equally wide along its whole length, and reaching from anterior mesonotal margin to level of anterior angles of cruciform elevation. Paramedian fasciae curved mesad, and reaching from anterior mesonotal margin to half length mesonotum; paramedian fasciae anteriorly half as wide as median fascia, but distally widened to same width as median fascia. A pair of round, black-brown spots in front of anterior angles of cruciform elevation. A pair of short, brown streaks at anterior mesonotal margin, laterally of paramedian fasciae. Lateral fasciae broken up into a narrow triangular spot at 1/3 of mesonotal length and a fascia, which is narrow proximally and as wide as median fascia distally, on posterior half of mesonotum.

*Legs.* Pale brown. Fore femora with brown marks on inner and outer sides and with two semi-erect dark-brown spines. Innerside of middle femora with brown mark. Fore and middle tibiae with subapical brown ring. Pretarsi of middle legs dark brown (right fore leg and tarsi of left fore leg missing).

*Tegmina and wings.* Tegmina with basal veins of 1st, 2nd, 3rd and 5th apical areas lightly infuscated and with tiny fuscous spots at apices of longitudinal veins of 1st to 6th apical areas. Basal venation of tegmen yellowish brown variegated with black-brown, apical venation dark brown. Venation of wing light brown.

*Operculum* (Fig. 34). Pale brown, triangularly shaped, short, reaching to one sixth of length of abdominal segment 3. Medial margin very slightly sinuate. Lateral margin weakly concave close to rounded apex.

*Abdomen.* Pale brown. Segment 2 including timbal coverings darker brown; timbal covering triangular with broadly rounded apical part. Lateral and medial margins straight. Segments 3 and 4 dorsally with darker-brown paramedian spots. Dorsal sides of segments 7 and 8, posterior margin of sternite 6 and distal half of sternite 7 dark brown. Sternites 3–5 with very light-brownish bicuspidate median spot at about 2/3 of sternite length.

*Genitalia.* Pygofer as in Figs 29, 31. Medial uncus lobe as in Fig. 30. Clasper (Fig. 32) with broad basal part bearing two fairly small spines: a slightly laterally curved, lateral spine with short recurved tip and a slightly laterally curved, fairly narrow, medial spine, which is somewhat shorter than the lateral spine.

#### *Measurements*

Body length 20.5 mm; head width 6.7 mm; pronotum width 6.7 mm; tegmen length 26.5 mm.

#### *Etymology*

This species is named after Mick Webb, cicadellid specialist and collection manager at the Natural History Museum, London, whose continuous help in making the material from his collection available to me is gratefully acknowledged.

### *Inflatopyga mouldsi*, sp. nov.

(Figs 1, 35–38)

#### *Material Examined*

*Holotype.* ♂, "SOLOMON ISLANDS / Malaita Is. / 25 June 1984 / Steven Lamond", collection M. S. Moulds.

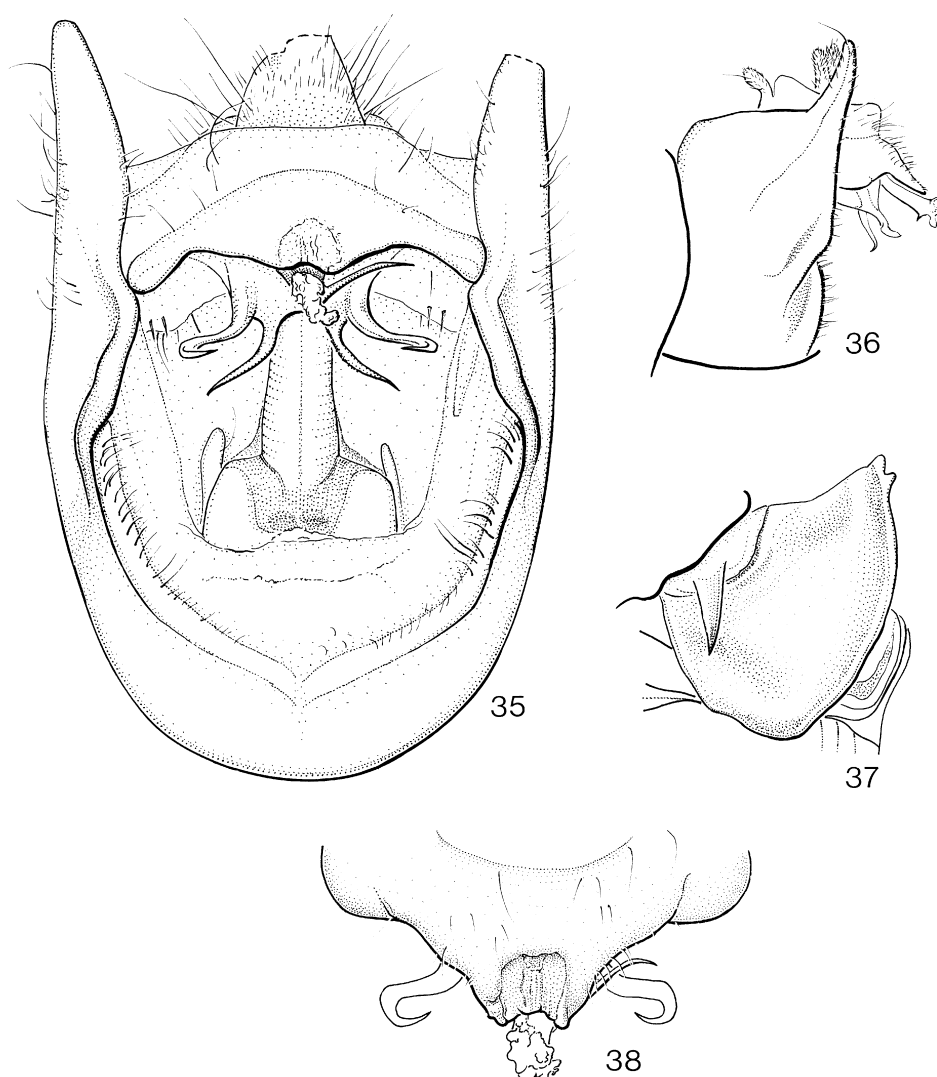
*Paratype.* **Solomon Islands, Malaita Island:** Kwalo, 350 m, 28.ix.1957, J. L. Gressitt, 1 ♀, BPBM.

#### *Description*

##### *Male*

Ground colour of body pale brown.

*Head.* Head from dorsal aspect with black-brown trilobate spot enclosing ocelli, anterior lobe with two laterodistal triangles, each of basal lobes also with laterodistal triangle; a narrow light-brown line extends from trilobate spot to a brown line in middle part of hind margin of head. Pair of small black-brown spots between paired ocelli and eyes, narrowly connected forward with dark-brown spot in light-brownish suffusion on vertex lobes. Supra-antennal plates with small dark-brown spot. Anterior part of postclypeus with a series of three brown, transverse lines on either side; medial ends of these lines fused into an oval ring with open upperside. Median, brown, continuous, line on postclypeus reaching from oval figure nearly to clypeal suture. Lower part of postclypeus with three pairs of very faint, light-brown spots.



**Figs 35–38.** *Inflatopyga mouldsi*, holotype male. 35, Pygofer in ventral view; 36, pygofer in lateral view; 37, operculum in ventro-lateral view; 38, medial uncus lobe in ventral view.

*Thorax.* Paired central fasciae brown to black-brown, continuous, diverging forward and fused in fairly short fascia along middle part of anterior pronotal margin, proximally crescentic, and very narrow in between both ends. Posterior oblique fissures and lateral part of ambient fissure with narrow dark-brown line.

*Mesonotum.* Fasciae and spots black-brown. Median fascia fairly broad, reaching from anterior mesonotal margin nearly to cruciform elevation, and equally wide along its length although slightly narrowing at both ends. Paramedian fasciae slightly curved mesad, about as broad as medial fascia but somewhat narrower at half of its length, and reaching from anterior mesonotal margin to just beyond half length mesonotum. A pair of oval spots in front of anterior angles of cruciform elevation. A pair of streaks at anterior mesonotal margin, laterally of paramedian fasciae. Lateral fasciae broken up into a very small and a larger spot at 1/3 of mesonotum length from anterior margin, and a short fascia of the same width as the other fasciae.

*Legs.* Fore femora with two narrow, brown lines, distally connected in a fairly large brown triangle on innerside, a broad brown fascia on upperside, which is connected with a large brown, distal spot on outerside. Innerside of middle femora with brown mark. Underside of hind femora distally brown. Fore and middle tibiae distally with brown stripes. Tarsi of all legs missing.

*Tegmina and wings.* Tegmina with basal veins of 1st, 2nd, 3rd and 5th apical areas infuscated and with very faint, light-brownish spots at apices of longitudinal veins of 1st to 4th apical areas. Basal half of venation of tegmen yellowish brown variegated with black, apical venation dark brown. Venation of wings brown.

*Operculum* (Fig. 37). Very pale brown, short, reaching to 1/4 of length of abdominal segment 3. Medial and lateral margins convex.

*Abdomen.* Timbal coverings triangular, rounded apically, lateral margin straight, medial margin weakly convex. Segments 2–6 pale brown, dorsally with median brown line on anterior half of segment 2, and a pair of lateral dark-brown spots on segment 4, ventrally with brown line along middle part of hind margins of sternites 5 and 6. Tergite and sternite of segment 7 dark brown, tergite of segment 8 blackish brown.

*Genitalia* (Figs 35, 36, 38). Medial lobe as in Fig. 38. Lateral lobes of pygofer (Fig. 35) parallel. Clasper (Fig. 35) with broad basal part bearing two spines: a laterally curved, fairly long and slender, lateral spine, which is apically curved inwards toward medial spine, and a laterally curved, medial spine, which is nearly as long as the lateral spine.

#### *Female*

Marking on head and thorax dark brown to black-brown. Operculum reaching posterior margin of abdominal segment 2. Lateral margin weakly convex, laterodistal angle oblique. Posterior margin weakly undulate. Ground colour of abdomen darker brown than in male, dorsally, densely covered with silvery hairs. Segment 2 dorsally with median, brown line reaching to 2/3 of segment length. Segments 2–4 with a pair of dorsal, paramedian, brown spots; spots on segment 2 small and round, on segment 3 larger and reaching to segment's hind margin, on segment 4 about quadrangular and as high as segment. Segment 4 with pair of lateral, black-brown spots with a diameter of more than half the segment's length. Segments 5–7 with sublateral, brownish marks and small, lateral, round, brown spots. Sternite 7 medially black-brown. Segment 9 dorsally with a pair of large, dark-brown triangles at anterior margin reaching to half-way segment length, and ventrally with a pair of black-brown marks at 2/3 of length of lower segment margins.

#### *Measurements*

Body length ♂ 20.5 mm, ♀ 21 mm; head width ♂ 7.2 mm, ♀ 7.6 mm; pronotum width ♂ 7.4 mm, ♀ 7.8 mm; tegmen length ♂ 29 mm, ♀ 30.5 mm.

#### *Etymology*

This species is named after Max Moulds, who contributed so much to the knowledge of the cicada fauna of Australia, particularly by the publication of his excellent book 'Australian Cicadas' (1990).

#### *Inflatopyga* sp.

Three females from Bougainville with the following data: Kukagai Village (Buin), 17.x.1960–2.ii.1961, W. W. Brandt, 1♀, ANIC; Kukagai Vill., Dec. 1960, 150 m, W. W. Brandt, 2♀, BPBM, could not be attributed with some certainty to one of the species endemic to Bougainville Island.

### Acknowledgments

For the loan of material I am very much indebted to Mr K. Arakaki and Mr G. M. Nishida (BPBM, Honolulu), Dr R. Emmrich (SMTD, Dresden), Dr G. A. Holloway (AMS), Mr M. S. Moulds (AMS and private collection, Sydney), Dr N. D. Penny (CAS, San Francisco), Dr D. T. Vásárhelyi (TMB, Budapest) and Mr M. D. Webb (BMNH, London). I am very grateful to Dick Langerak for the preparation of the figures, to Arnold de Boer and two anonymous referees for critical reading of earlier drafts of this paper, and to Gerard Verlaan for technical assistance. I particularly thank Max and Barbara Moulds and their son Tim, and Courtenay and Smila Smithers, for their hospitality during my visit to Sydney. Grants from the Netherlands Foundation for the Advancement of Tropical Research (WR 87–147), the Uyttenboogaart-Eliassen Foundation, Amsterdam, and the Association for Scientific Tropical Research, Amsterdam, supported my visits to the Australian Museum, Sydney, and the Bernice P. Bishop Museum, Honolulu.

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