THE GENUS *THEOBALDIA* (DIPTERA, CULICIDAE) IN VICTORIA. II.

By N. V. Dobrotworsky, Zoology Department, University of Melbourne.*

(Three Text-figures.)

[Read 31st August, 1960.]

Synopsis.

Two new species of *Theobaldia*, *T. drummondi* and *T. sylvanensis* have been found in the Dandenong Ranges breeding in pits concealed by undergrowth and debris. Larvae of both species are typical subterranean inhabitants: they are milky-white in colour and show no response to moving shadows.

The larvae of a third new species, *T. otwayensis*, n. sp., have been found in a pool under a fallen tree; they are brownish and react normally to moving shadows. All three species belong to the subgenus *Culicella*.

All Australian species of the genus *Theobaldia* are uniformly brownish in colour and lack ornamentation. The species are not easily recognized and, since the pleural scales become detached very easily, reliable identification may be impossible unless the specimens are in really perfect condition. On the other hand, the larvae of all known species can be separated easily, and because of this adults bred from larvae are most important in the study of the genus in Australia.

Collecting of larvae in the field entails great difficulties, as apparently most of the species breed in subterranean waters.

Raising the progeny of females collected and fed in nature is laborious since the immature stages require low temperature (optimum 14–15°C.) at which development is very slow; in laboratory conditions it takes up to four or five months. Nevertheless reared specimens with the associated larval and pupal skins should be used for description of new species.

The females of most species of *Theobaldia* are very similar and provide only a few conspicuous morphological traits by which they can be distinguished from one another. Previously it had been found that females of *T. frenchi* Edw. and *T. hilli* Edw. could sometimes not be separated with confidence, and similar difficulties now arise with other species. Some adults of *T. drummondi*, n. sp., can hardly be distinguished from those of *T. victoriensis* Dobr.; the male terminalia which usually enable reliable identification to be made are very similar in *T. sylvanensis*, n. sp., and *T. frenchi* Edw.

Two of the new species described in this paper, *T. drummondi* and *T. sylvanensis*, are closely related to *T. victoriensis*; the third, *T. otwayensis*, appears to be a link between the *victoriensis* group of species and *T. inconspicua* Lee.

Distribution and Ecology: *T. drummondi* and *T. sylvanensis* are known from only one locality which is situated on the eastern slopes of the Dandenong Ranges. They were found on a west-facing hillside with a good cover of forest and undergrowth. The larvae were breeding in pits some 2–3 feet deep, concealed by undergrowth, fallen branches and other debris. The origin of these pits is obscure and possibly they are derived from deserted wombat burrows. The water in them is more or less cloudy and its temperature remains low even during the summer (11°C. in October, 15°C. in February). During the spring the water level may be close to the surface, but during the unusually dry summer of 1959–60, even the deepest pits contained only a few inches of water.

The larvae and pupae of these two species are able to develop normally only at low temperatures. In the laboratory they produced adults successfully at 13°–15°C., but

* This work was supported in part by a grant from the Trustees of the Science and Industry Endowment Fund of Commonwealth Scientific and Industrial Research Organization.

temperatures above 20°C. are fatal for larvae and pupae: at 23°C. all larvae died within six days and pupae died without producing any adults.

During the spring the dominant species was *T. victoriensis* (65·2%); less numerous were *T. drummondi* (27·7%), *T. sylvanensis* (7·1%) and odd specimens of *T. frenchi*. Larvae of *T. drummondi* and *T. sylvanensis* are similar to other subterranean Victorian species (*victoriensis*, *frenchi* and *hilli*); they are milky-white in colour, show no response to moving shadows and, if disturbed, generally do not move down to the bottom, but remain close to the surface.

The larvae of *T. otwayensis* have been found in the Cape Horn area of the Otway Ranges, in a pit under an uprooted tree and shaded for most of the day. The water was slightly cloudy, with a temperature of 13–14°C. The larvae of *Aë. queenslandis* Strick. were numerous, but only one larva of IV stage and eleven larvae of II stage of *T. otwayensis* have been collected.

Biting Habits: *T. drummondi* and *T. sylvanensis* are day-biting species which attack man freely near their breeding places. Nothing is known yet about the biting habits of *T. otwayensis*.

THEOBALDIA DRUMMONDI, n. sp. (Fig. 1.)

Types.—The type series was bred from larvae collected 26.10.59 at Sylvan, Victoria. Holotype, allotype and 20 paratypes have their associated larval and pupal skins. The holotype male, allotype female, 5 paratype males and 5 paratype females are in the collections of the National Museum, Melbourne. One paratype male and one paratype female are in each of the following collections: C.S.I.R.O., Division of Entomology, Canberra; School of Public Health and Tropical Medicine, Sydney; University of Queensland, Brisbane; British Museum (Natural History), London; U.S. National Museum, Washington.

Distinctive Characters: Adult. Forked upright scales black in ♀; sometimes an admixture of lighter ones. Proboscis black. Scutum clothed with goldish scales with admixture of some dark-bronze scales. Tarsi with inconspicuous yellowish bands. Last two tarsal segments yellowish. Terminalia: Tergally, coxite has numerous long goldish mesially directed setae; basal lobe of coxite about two-thirds length of coxite. Phallosome simple, widening distally and with several small denticles on top.

Larva. Milky-white. Head seta 6, single. Lateral comb consists of stout, short tooth-like scales. Siphon brown with index 8·1–9·3. Basal siphonal tuft and setae 1–5 of VIIIth segment small tufts.

Holotype Male.—Vertex clothed with narrow curved creamy scales and forked upright scales, some light and some dark. Proboscis and palps dark-scaled. Palps as long as proboscis with labella. Integument light brown. Scutum clothed with narrow curved light goldish scales, with some admixture of dark bronze scales particularly in front of bare area. Scutal bristles goldish or dark. Scutellum with a few narrow pale scales and 6–7 long dark bristles on each lobe. Anterior pronotum with a few narrow curved pale scales and dark, or light, goldish bristles. Posterior pronotum with some narrow curved pale scales and hairs. Three spiracular bristles. Sternopleura with one strong dark bristle, several weaker pale ones and a few elongate pale scales. Four lower mesepimeral bristles; some narrow pale scales towards middle. Wing length: 4·7 mm. Legs: Femora and tibiae purplish-black above, ochreous pale below. Segments 3 and 4 of fore tarsi with yellow scales at base, segment 5 pale-scaled. Mid and hind tarsi with some yellowish scales at base of segment 3; segments 4 and 5, yellowish-scaled. Fore and mid claws toothed, hind claws simple. Tergites black-scaled; sternites dark-scaled with admixture of paler scales, which increase towards end of abdomen. Terminalia (Fig. 1, *a*, *b*): Coxite more than twice as long as broad with dark scales sternally and laterally. On sternal aspect coxite also bears long, strong setae laterally and apically. Tergally coxite has numerous long goldish, mesially-directed setae. Basal lobe of coxite about two-thirds length of coxite, it bears tuft of long curved setae at tip. Style slightly more than half length of coxite, broad at base, narrowing towards tip.

Terminal appendage small. Paraproct with six teeth. Phallosome simple, widening distally, with several small teeth at top. Lobes of IXth tergite prominent, with 12–14 long, strong setae.

Allotype Female.—This differs from the holotype as follows: Upright forked scales on vertex black. Torus and base of first antennal segment light brown. Palps one-fifth

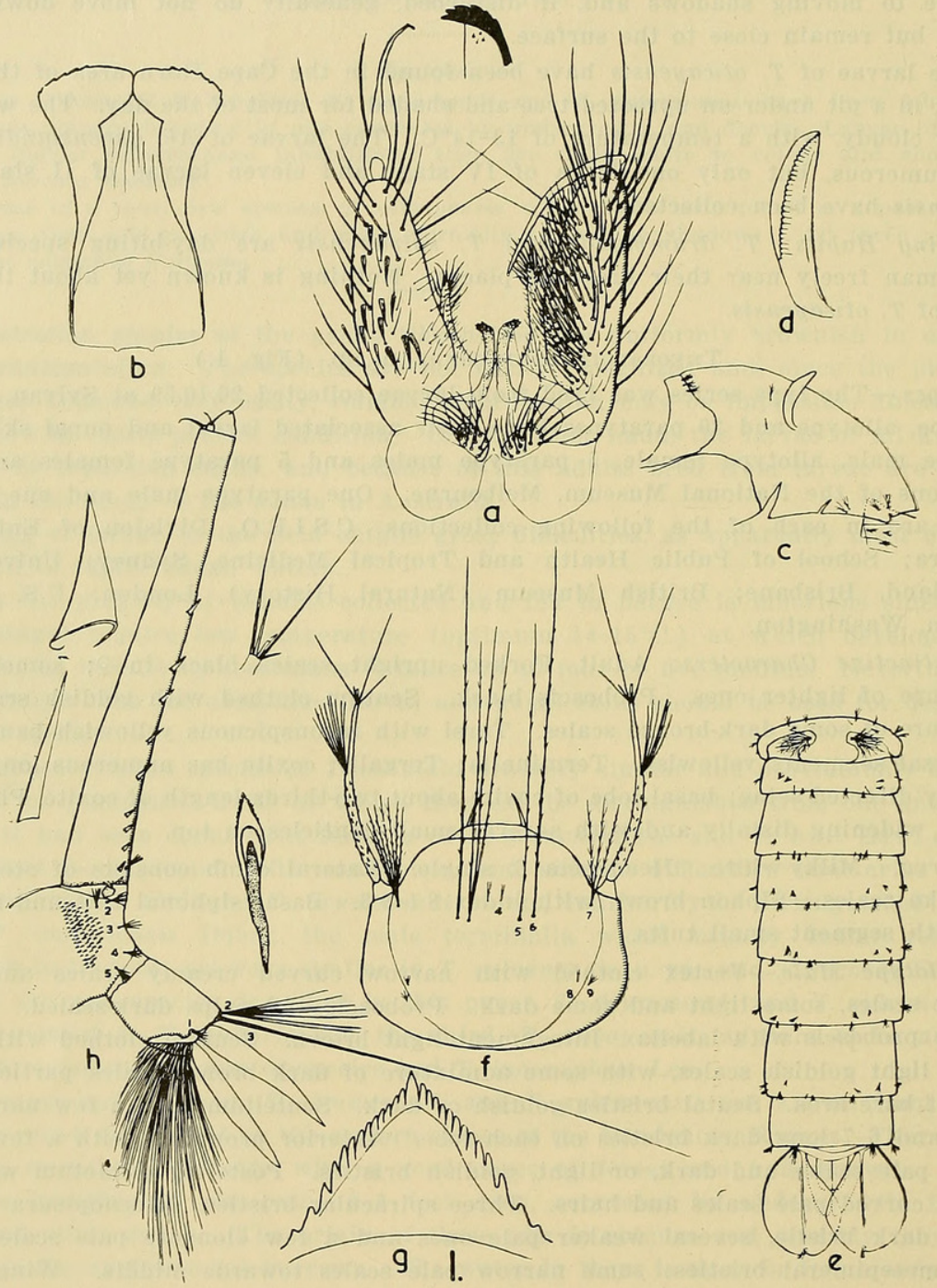

Fig. 1. *Theobaldia drummondi*, n. sp. *a-b*, ♂ terminalia: *a*, left coxite sternal aspect, right tergal aspect; *b*, phallosome; *c*, *d*, *e*, pupa: *c*, cephalothorax and metanotum; *d*, trumpet; *e*, abdomen; *f*, *g*, *h*, larva: *f*, head; *g*, mentum; *h*, terminal segments.

length of proboscis. Dark bronze narrow curved scales dominant on scutum. Mid lobe of scutellum with nine strong, dark bristles. One strong dark lower mesepimeral bristle and three weaker paler ones. Patch of elongate scales larger than in male. Wing length 5·2 mm., R_2 about four times its stem. There is a faint blotch in middle of wing membrane. Small creamy knee spots. Fore and mid tarsi with some pale scales at base of second segment, segments 3, 4 and 5 pale-scaled. Hind tarsi with narrow

bands of pale scales at base of segments 2 and 3; segments 4 and 5 pale. All claws simple. Sternites creamy with some admixture of dark scales.

Paratype Males.—The series of ten paratype males does not show much variation. There are some variations in length of palps, but they are always equal to, or slightly shorter than, proboscis with labella. Scutellum with 8–9 long bristles on each lobe. 3–5 lower mesepimeral bristles. Wing length: 4·3–4·8 mm. Pale-scaled sternites may have some admixture of ochreous and dark scales.

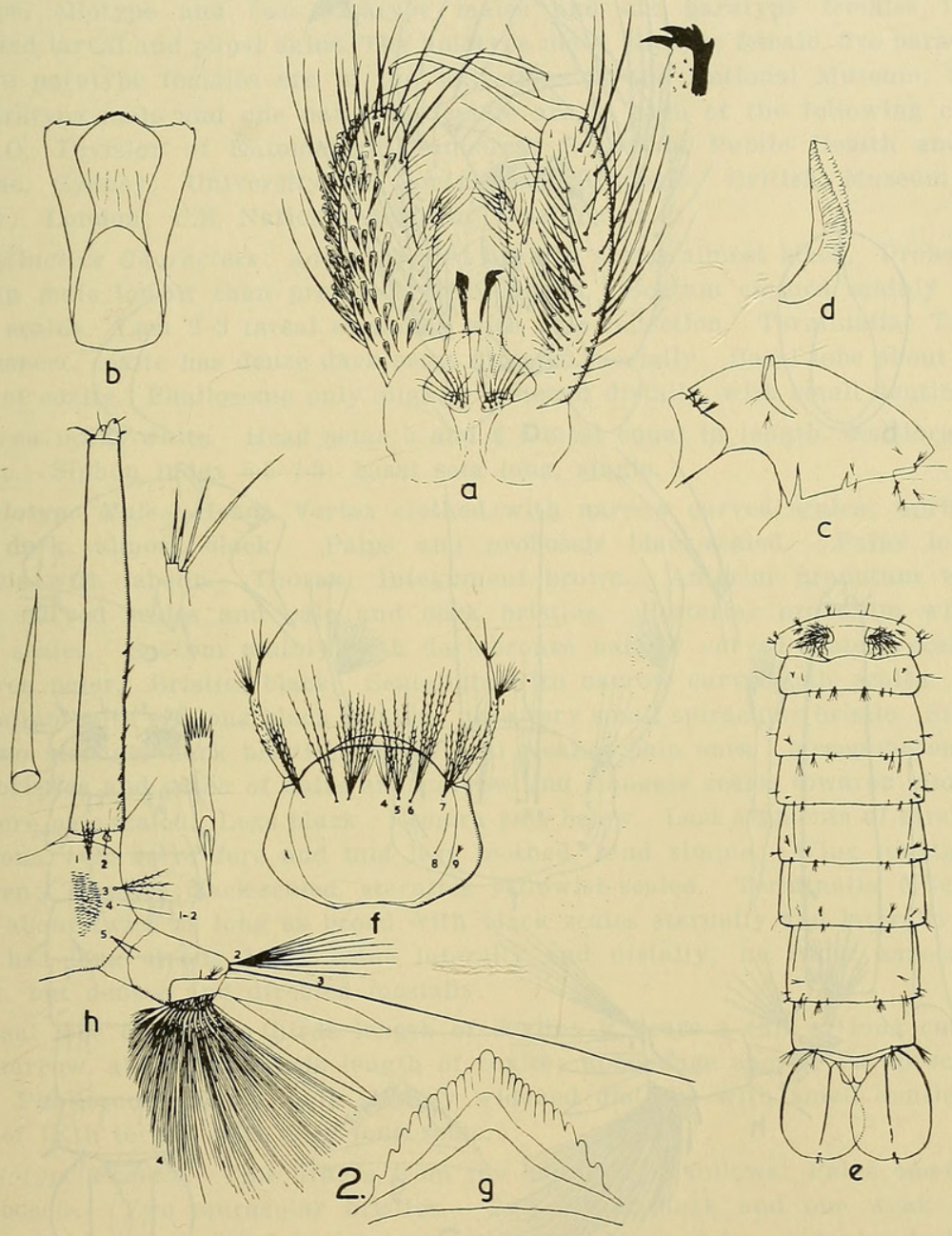

Fig. 2. *Theobaldia sylvanensis*, n. sp. *a-b*, ♂ terminalia: *a*, left coxite sternal aspect, right tergal aspect; *b*, phallosome; *c*, *d*, *e*, pupa: *c*, cephalothorax and metanotum; *d*, trumpet; *e*, abdomen; *f*, *g*, *h*, larva: *f*, head; *g*, mentum; *h*, terminal segments.

Paratype Females.—The series of ten paratype females likewise does not show significant variations. Proportion of golden and dark bronze scales on scutum varies; in some specimens bronze scales dominate, particularly mesially.

Scutellum with 8–11 long bristles. 4–6 lower mesepimeral bristles. First tarsal segment of hind legs may have pale scales at base. Sternites may be dark-scaled with admixture of pale ochreous scales. Wing length 5·0–5·3 mm.; R_2 about 3·3–4·0 times its stem.

Pupa (Fig. 1, *c*, *d*, *e*). All abdominal setae small, tuft-like, no long setae as in other species.

Larva (Fig. 1, *f*, *g*, *h*). Head yellowish; body milky-white; siphon brown, thoracic setae black. Head: seta 4 small, 2-branched; 5, single or 2–3-branched; 6, single; 7, 3–7-branched; 8 and 9, 2–4-branched. Antenna long curved, slightly shorter than length

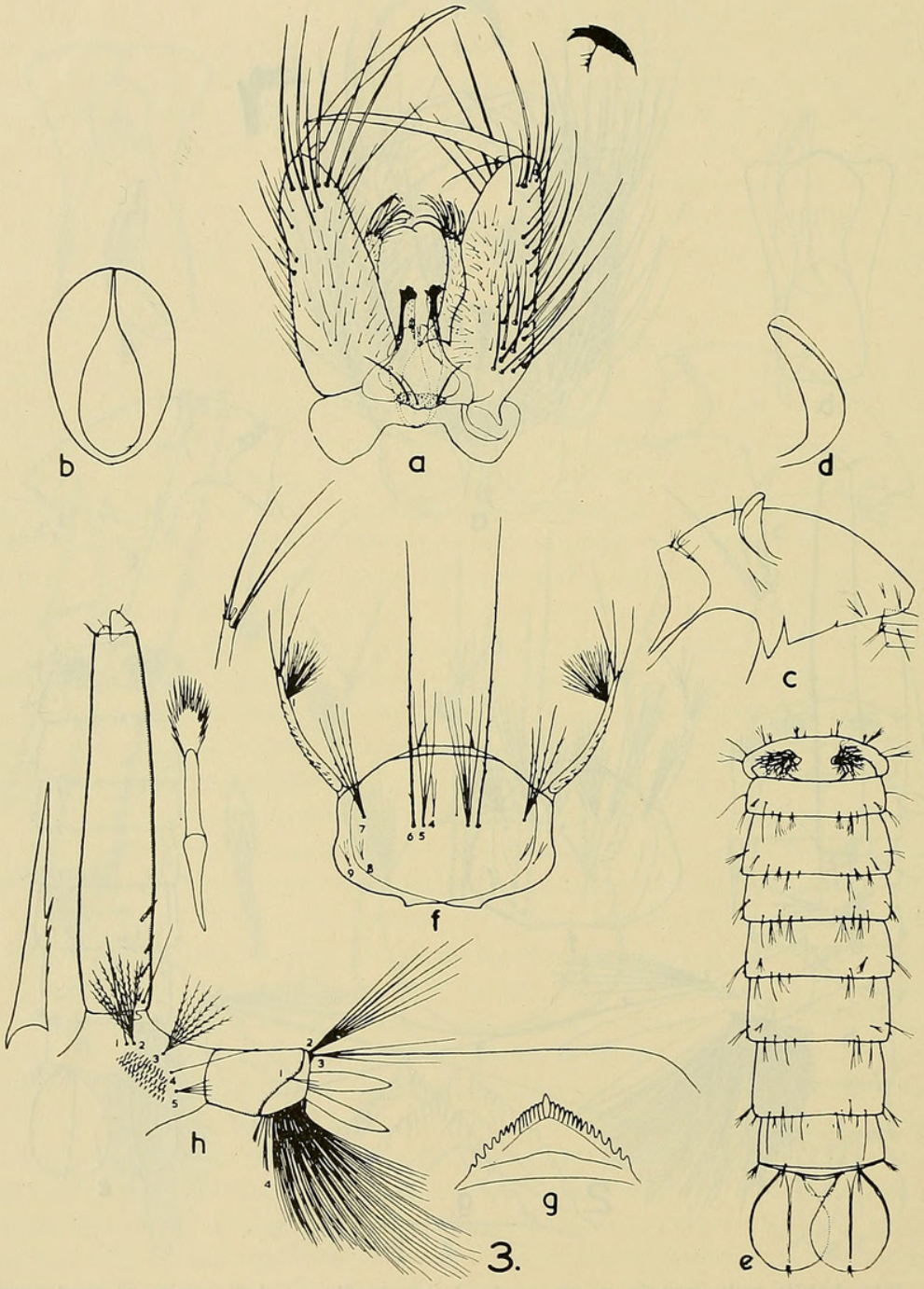

Fig. 3. *Theobaldia otwayensis*, n. sp. *a-b*, ♂ terminalia: *a*, left coxite sternal aspect, right tergal aspect; *b*, phallosome; *c*, *d*, *e*, pupa: *c*, cephalothorax and metanotum; *d*, trumpet; *e*, abdomen; *f*, *g*, *h*, larva: *f*, head; *g*, mentum; *h*, terminal segments.

of head; seta 1 with 19–24 branches. Mentum with longer central tooth and 13 lateral teeth on each side. Thorax: Prothoracic setae 1–6 single, except seta 4, which is a minute tuft, and seta 7 which is 2–3-branched. Abdomen: VIIIth segment: Lateral comb triangular patch of more than a hundred stout, tooth-like scales. Setae 1–5 small tufts. Siphon very long, gradually tapering, with index 8·1–9·3, mean 8·6. Basal siphonal seta small tuft. Pecten of 8–11 flattened spines. Anal segment: Saddle complete

ring. Seta 1, small tuft; 2, 6–7-branched; 3, single; 4 (ventral brush) of 13–14 tufts. Anal papillae long narrow, pointed, almost twice as long as saddle.

This species is named in honour of Dr. F. H. Drummond who discovered the breeding site of this species, generously co-operated, and has shown much interest in mosquito work carried out by the author.

THEOBALDIA SYLVANENSIS, n. sp. (Fig. 2.)

Types.—The type series was bred from larvae collected 26.10.59 at Sylvan, Victoria. Holotype, allotype and two paratype males and six paratype females have their associated larval and pupal skins. The holotype male, allotype female, five paratype males and five paratype females are in the collections of the National Museum, Melbourne. One paratype male and one paratype female are in each of the following collections: C.S.I.R.O., Division of Entomology, Canberra; School of Public Health and Tropical Medicine, Sydney; University of Queensland, Brisbane; British Museum (Natural History), London; U.S. National Museum, Washington.

Distinctive Characters: *Adult.* Forked upright scales almost black. Proboscis black. Palps in male longer than proboscis with labella. Scutum clothed mainly with dark bronze scales. Last 2–3 tarsal segments with pale reflection. Terminalia: Tergally, on inner aspect, coxite has dense dark setae directed mesially. Basal lobe about two-thirds length of coxite. Phallosome only slightly widened distally, with small denticles on top.

Larva milky-white. Head setae 5 and 6 almost equal in length, multibranched and plumose. Siphon index 5·5–7·9; basal seta long, single.

Holotype Male.—Head: Vertex clothed with narrow curved scales; upright forked scales dark, almost black. Palps and proboscis black-scaled. Palps longer than proboscis with labella. Thorax: Integument brown. Anterior pronotum with a few narrow curved scales and pale and dark bristles. Posterior pronotum with narrow curved scales. Scutum mainly with dark-bronze narrow curved scales; scales around bare area paler. Bristles black. Scutellum with narrow curved pale scales. Each lobe of scutellum with six long black bristles. One very small spiracular bristle. Sternopleura with two stronger dark bristles and several weaker pale ones. Mesepimeron with two lower bristles and patch of hairs and narrow and elongate scales towards middle. Knob of haltere pale-scaled. Legs black. Femora pale below. Last segments of tarsi with pale reflections. Claws of fore and mid legs toothed, hind simple. Wing length: 4·0 mm. Abdomen: Tergites black-scaled, sternites yellowish-scaled. Terminalia (Fig. 2, *a*, *b*): Coxite about twice as long as broad with black scales sternally and laterally. Tergally coxite has long strong black setae laterally and distally; on inner aspect they are shorter, but denser and directed mesially.

Basal lobe about two-thirds length of coxite; it bears a tuft of long curved setae. Style narrow, about two-thirds length of coxite; appendage short. Paraproct with five teeth. Phallosome simple, only slightly widened distally, with small denticles at top. Lobes of IXth tergite with 8–10 long setae.

Allotype Female.—This differs from the holotype as follows: Palps one-fifth length of proboscis. Two spiracular bristles. Two strong dark and one weak pale lower mesepimeral bristles. Hind femur pale with dorsal black stripe, widening to knee. Fore tarsi with last three segments pale; mid and hind tarsi with some pale scales on second segment, segments 3–5 completely pale. All claws simple. Wing length 4·1 mm., R_2 about three times its stem.

Paratype Males.—The series of ten paratype males does not show much variation. The upright forked scales may be paler than in holotype. There is some variation in length of the palps, but they are always slightly longer than the proboscis with labella. Usually only one spiracular seta, which in some specimens cannot be located. Each lobe of scutellum with 6–7 long black bristles. 2–4 lower mesepimeral bristles. Venter may be pale-scaled or with admixture of some black scales, particularly basally on each sternite. Wing length 3·7–4·1 mm.

Paratype Females.—The series of ten paratype females likewise does not show much variation. Vertex may have a mixture of dark and pale upright forked scales. Each lobe of scutellum may have from 6 to 8 long bristles. 2–3 lower mesipimeral bristles. Wing length: 3·8–4·3 mm., R_2 about 3·3–3·6 times its stem.

Pupa (Fig. 2, *c*, *d*, *e*). Can be distinguished from the pupa of *T. drummondi* by abdominal seta 5, which is single and long on segments 4–7.

Larva (Fig. 2, *f*, *g*, *h*). Head and siphon yellowish; body milky white; setae black. Head: Seta 4, large, 3–5-branched; 5, 4–7-branched; 6, 3–5-branched; 7, 4–8-branched; 8, single; 9, 2–5-branched. Setae 5, 6 and 7 plumose. Antenna about two-thirds length of head. Seta 1, 5–10-branched. Mentum with 11–12 lateral teeth on each side. Thorax: Prothoracic setae 1–6 single; seta 7, 2-branched, seta 3 may be 2-branched. Abdomen: VIIIth segment: Lateral comb patch of more than a hundred fringed scales. Seta 1, 2–4-branched; 2 and 4, single; 3, 2–4-branched; 5, 2–3-branched. Setae 1 and 4 plumose. Siphon long, slightly tapering, with index 5·5–7·9, mean 6·7. Basal seta long, single. Pecten of 8–11 spines. Anal segment: Saddle complete ring. Seta 1, small tuft; 2, 4–6-branched; 3, single; 4 (ventral brush), of 14 tufts. Anal papillae long, narrow, pointed, about twice as long as saddle.

Theobaldia otwayensis, n. sp. (Fig. 3.)

Types.—The type series was bred from larvae collected 18.12.59 at Cape Horn (Otway, Victoria). All specimens have their associated larval and pupal skins. The holotype male and allotype female are in the collections of the National Museum, Melbourne. One paratype male and one paratype female are in collections of C.S.I.R.O., Division of Entomology, Canberra. One paratype female is in each of the following collections: School of Public Health and Tropical Medicine, Sydney; University of Queensland, Brisbane; British Museum (Natural History), London; U.S. National Museum, Washington.

Distinctive Characters: *Adult.* Upright forked scales creamy. Proboscis black. Male palps shorter than proboscis. Scutum clothed with dark brown scales. Posterior pronotum with hairs and narrow scales. Tarsi dark. Mesepimeron with patch of hairs towards middle. Male terminalia: Basal lobe two-thirds length of coxite. Phallosome oval. Lobes of IXth tergite with 1–2 strong setae. Larva brownish. Head seta 5, 3–5-branched. Siphon index 4·8–5·6; pecten of 3–5 spines; basal seta single.

Holotype Male.—Head: Vertex clothed with narrow, curved and upright forked, creamy scales. Proboscis and palps dark-scaled. Palps slightly shorter than proboscis without labella. Torus yellow. Thorax: Integument light brown. Scutum clothed with dark brown narrow curved scales and black bristles; scales around bare area light goldish. Scutellum with a few narrow light goldish scales and fine long black bristles. Anterior pronotum with dark bristles. Posterior pronotum with some dark bristles. Two small spiracular bristles. Sternopleura with one strong black bristle, a few weak pale ones and a few narrow curved scales. Mesepimeron with one strong and one weaker dark lower bristles, and pale hairs towards middle. Legs dark. Wing length 3·8 mm. Underside of subcostal vein with hairs and 2–3 dark scales. Abdomen: Tergites black-scaled, sternites with brownish scales. Terminalia (Fig. 3, *a*, *b*): Coxite more than twice as long as broad, with long, strong and fine setae. Basal lobe about two-thirds length of coxite; it bears a tuft of rather long, curved, thick setae. Style as long as coxite, almost straight; terminal appendage small. Phallosome simple, oval in shape. Paraproct with three teeth. Lobes of IXth tergite inconspicuous, with 1–2 strong setae.

Allotype Female.—This differs from the holotype as follows: Palps one-eighth length of proboscis. Mid lobe of scutellum with seven long bristles. Posterior pronotum has more hairs and a few narrow curved scales. Mesepimeron with hairs and a few narrow scales towards middle. Wing length 4·3 mm., R_2 about four times its stem. Legs black-scaled, femora lighter ventrally. Scales of sternites lighter than in male.

Paratype Females.—The series of seven paratype females likewise does not show much variation. Mid lobe of scutellum may be with 6–8 long bristles. Up to 5 small, pale spiracular bristles. Mesepimeron may be with one long dark lower bristle. Lower part of sternopleura usually with one long, strong, dark bristle, one weaker and shorter, and several fine ones. Wing length 4·1–4·5 mm.

Pupa. Details shown in figure 3, *c*, *d*, *e*.

Larva (Fig. 3, *f*, *g*, *h*). Brownish head about three-fifths as long as broad. Antenna slightly shorter than length of head. Seta 1 about 2–5-branched. Head: Seta 4, moderately long, single or 2-branched; 5, 3–5-branched; 6, single; 7, 3–4-branched; 8 and 9, 2–3-branched. Mentum small, with larger central and 13–14 lateral teeth. Thorax: Prothoracic setae 1–7 single, but seta 4 may be 2-branched on one side. Abdomen: VIIIth segment: Lateral comb patch of 50–60 fringed scales. Seta 1, plumose, 8–9-branched; 2 and 4, single; 3, plumose, 5–6-branched; 5, 3–4-branched. Siphon slightly tapering; index 4·8–5·6. Pecten of 3–5 spines. Basal seta single. Anal segment: Saddle complete ring. Seta 1, 2-branched, about one-third of length of saddle; 2, 6–8-branched; 3, with 1 long and 2 short branches; 4 (ventral brush) of 15–17 tufts. Anal papillae narrow, pointed, about as long as saddle.

Acknowledgements.

I am indebted to Dr. F. H. Drummond and J. A. Thomson, Melbourne University, who discovered the breeding places of these three new species of *Theobaldia*.