

## A New Genus and Species of Athericidae (Diptera: Tabanoidea) from Cape York Peninsula

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**ABSTRACT.** The new athericid *Suraginella macalpinei* n.gen., n.sp. is described on specimens from the Claudie River and Jardine River systems in the north of Cape York Peninsula. This distinctive taxon is compared with the widespread Old World genus *Suragina* Walker, 1858, to which it has some misleading resemblances. Many differences are detailed between these genera. In the closure of wing cell  $m_3$ , and in having dorsal setae on certain radial and cubito-anal veins in the female, *Suraginella* resembles the rare monotypic Brazilian genus *Xeritha* Stuckenberg, 1966. Although these conditions are apomorphies, they are considered unreliable for cladistic analysis. A survey of the occurrence of such setose veins in other Athericidae and in the sister-group Tabanidae shows them to be sporadic, variably developed, and probably subject to homoplasy. No sister-group of *Suraginella* can be identified. The presence of a hard, dark mass in the abdomen of half of the available females indicates with high probability that *S. macalpinei* takes bloodmeals from a vertebrate host. A test of gut contents for the presence of blood, using urological test strips, gave a strong positive result but is not conclusive. Biological considerations suggest that *Suraginella*, although occurring in both “tip-of-peninsula” and “mid-peninsula” rainforest regions of Cape York Peninsula, may be independent of the forest biome. The preferred range of the aquatic larval stages in river profiles may determine distribution. Present information suggests that *Suraginella* may be part of the old “autochthonous” element in Australia.

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The Australasian Athericidae have not been the subject of any study since the monograph by Paramonov (1962) on the Rhagionidae (= Leptidae). At that time, Athericidae had not been distinguished from the Rhagionidae as a separate family; this distinction was made by Stuckenberg (1973) and is now generally accepted. Paramonov's monograph dealt only with the fauna of continental Australia and Tasmania. He thus excluded those species of the athericid

genus *Suragina* Walker, 1858, also classified then as rhagionids, which had been described from the Indonesian (Maluku) section of the Australasian Region (see Nagatomi & Evenhuis, 1989). The only athericid genus recorded by Paramonov was *Dasyomma* Macquart, 1840. A species named originally as *Atherix pusilla* Macquart, 1858, based on a specimen from Adelaide, was transferred to the widespread rhagionid genus *Chrysopilus* Macquart, 1826.

*Dasyomma* is the only athericid genus with a southern Gondwanan distribution, occurring in both mainland Australia + Tasmania and Chile + Argentina—an AS group in Hennig's (1960) terminology. It was considered by Stuckenberg (1973) to be a sister-group to all other athericids, and was segregated in its own subfamily, the Dasyommatinae (originally named incorrectly as Dasyomminae). The 11 named species recorded by Paramonov are limited to montane habitats with running water suitable for the aquatic larvae. Six species occur in New South Wales (two of them in the ACT), four in Tasmania, and one in the southern extremity of Western Australia. A specimen from the Atherton Tableland of northern Queensland was not named, although it probably represents a twelfth species.

The presence of another athericid taxon in Australia was revealed when Colless & D.K. McAlpine (1970) recorded an unnamed "*Atherix*" in the textbook *The Insects of Australia*. In response to my enquiry about this, Dr David McAlpine sent me the small series on which this record was based. At that time, the generic classification of Athericidae was relatively undeveloped and *Atherix* was a general repository for species of uncertain affinity. I established that the specimens probably represented a new genus and species of the subfamily Athericinae. Study of these interesting flies had then to be deferred, but in the long intervening period many additional specimens were collected. A fresh examination based on all available material now confirms the identification of a new genus and species, herein named *Suraginella macalpinei* n.gen., n.sp.

#### Material and methods

The specimens are dried, pinned flies in the collections of the Australian Museum, Sydney, and the Department of Zoology and Entomology at the University of Queensland, Brisbane, and in the collection of G. Daniels of Brisbane. Standard morphological terminology is used; the naming of wing veins follows J.F. McAlpine (1981). Nomenclature of thoracic features follows the description and illustrations by Stuckenberg (1973). Details of hypopygial structures and female mouthparts were obtained from specimens macerated in hot KOH and mounted in glycerine jelly after dissection. Wing length was measured from the distal end of the basicostal scale. Thoracic length was measured from the anterior margin of the mesonotum to the posterior edge of the scutellum as seen in dorsal view. Overall length of females was not measured as their abdomen is always irregularly curved. Overall length of males excludes antennae. T = tergite, S = sternite. Label data are cited as originally given; a slash (/) indicates the end of a line of printing on a label.

#### Systematic description

The flies at first sight seemed to be of a strange, unusually small species of *Suragina*, a genus not yet recorded in Australia. Close study, however, revealed many differences; to bring these out, a detailed comparison with *Suragina* is made in the following generic description.

#### *Suraginella* n.gen.

**Type species.** *Suraginella macalpinei* n.sp.

**Etymology.** Diminutive of *Suragina*—suggested by the superficial resemblance of these small athericines to the considerably larger species of that genus; feminine.

**Diagnosis.** Relatively small athericines with unusually short abdomen, broad and strongly patterned wing, and distinctive appearance due especially to conspicuously banded abdomen; cell  $m_3$  closed; anal lobe sexually dimorphic, broader in ♂; T1 not divided in midline in either sex; ♀ wing with setae dorsally on  $R_{4+5}$ , basal part of  $R_5$ , and all of CuA; gonostyle with prominent elongate extension at base; ♀ vertex sunken, ocellar tubercle close to upper extremity of frons and not visible in lateral view; ♀ frons without velvety-black pruinescence over upper section.

#### Description

**Male. Head.** Flattened in longitudinal axis, much broader than long; eyes very close together over most of length of frons, narrowly separated by a distance less than width of anterior ocellus, diverging only slightly towards ocelli, diverging over a short distance above antennae and enclosing small, subtriangular frons which has a transverse impression; frons with shifting, silvery-grey pruinescence over entire length, lacking setae; ocellar tubercle partly visible in lateral view, situated a short distance anterior to upper eye corners; antennae set very low; parafacials entirely inclined towards face, not visible laterally; genae not visible laterally; face deeply recessed, hidden in lateral view; palps slender, strongly arched; proboscis distinctly shorter than head height (Fig. 1). [In *Suragina*, frons usually very narrow over upper section and tapering towards ocelli over most of its length due to gradual convergence of eye margins, appearing slightly biconcave because of curved eye margins; lower triangular portion of frons above antennae extending more extensively upwards; frons at narrowest clearly less than transverse width of anterior ocellus; lower frons usually with distinct setae; ocellar tubercle prominent in lateral view, situated relatively further forwards and posteriorly enclosed by a patch of shining pruinescence; face small but visible in lateral view; proboscis relatively longer, more slender, than in *Suragina*.]

**Thorax.** Relatively less elongated than in *Suragina*; postmetaspiracular scale well formed, flat; suprametacoxal pit of typical athericine form; metapleural epimera visibly extended to midline of venter and uniting behind metacoxae. Fore and middle legs slender; fore tarsus with long setae below; fore claws and pulvilli highly asymmetrical, inner claw short, slender, pointed, slightly curved, outer claw much larger, strongly curved, flattened, apex rounded; outer pulvillus enlarged, like a leaf partly curled longitudinally, darker brown than inner pulvillus and with narrow dark border; tibial spurs 0.2.2, posterior spur of middle leg reduced, less than half length of anterior spur. Hind leg: coxa with pale knob on anterior face, and pale, bluntly

rounded apical spur; femur laterally flattened except basally, of almost uniform width throughout, a shallow groove impressed over apical half of anterior face; tibia (Fig. 1) strongly flattened, with pronounced longitudinal groove over most of length of anterior and posterior surfaces, in lateral view tapering moderately towards base, slightly narrowed apically; tarsomeres relatively stout, basitarsus longer than tarsomeres 2–5 together, entire tarsus appearing almost cylindrical with only slightly decreasing diameter apically. Femora with many long setae; all tibiae with abundant, small, dark, stiff, suberect setae; hind tibia with prominent fringe of long, dark, stiff setae on dorsal surface, on ventral surface a dense fringe of much shorter setae. Femora 1 and 2 of about equal length in both sexes, tarsus 3 about  $1.1 \times$  length of tarsus 2 in both sexes; tarsus 1 about  $1.3\text{--}1.4 \times$  length of tibia 1 in both sexes [in all these proportions resembling *Suragina*]; femur 3 about  $1.7 \times$  length of femur 2 in ♂. [In *Suragina*, all legs appear to be more slender and elongate; hind femur and tibia moderately flattened, also with longitudinal groove on flattened surfaces, and fringed dorsal and ventral surfaces; tibiae with very small, stiff, dark setae but these usually depressed, except on ventral surface of tibia 1 where they are erect.]

*Wing* (Fig. 1). Relatively short and broad, broadest basally near basal end of large anal lobe, apex moderately rounded; alula and lower calypter large. Cell  $m_3$  closed at margin or with short stalk.  $R_4$  gently sinuous and ending at or just anterior to wing apex;  $M_3$  markedly arched where it forms posterior border of discal cell. Radial and cubito-anal veins without rows of erect setae dorsally. [In *Suragina* the wing distinctly more elongate; cell  $m_3$  nearly always open, if almost closed then this condition usually unstable; discal cell more elongate and closer to wing margin, apical section of  $M_3$  about half, sometimes less, of the preapical section forming posterior border of discal cell; greatest width of wing across its middle, and anal lobe more rounded. Veins  $R_{4+5}$ ,  $R_5$  and CuA without setae in both sexes.]

*Abdomen*. Proportionately short (Fig. 1), relatively slender, not wider than thorax; T1 with prominent anterior projection on each side of deep median depression, short behind this depression but without median notch in hind margin and not divided or weakened in midline; T2–5 all of about equal length, T6 and T7 shorter, T8 only about half of length of T7; S1 reduced to a narrow, transverse, asetose band not clearly distinct from S2; S7 elongate, and as long as T7+8, enabling hypopygium and S8 to be flexed dorsad into vertical posture. [In *Suragina* the abdomen more elongate, tapering progressively from T1 where it is widest; basal excavation in T1 proportionately smaller, subtriangular; T1 not divided in midline by a weakness or break in sclerotisation; sides of basal depression in T1 continue anterolaterally into anteriorly-directed humps which are relatively shorter and more transverse than in *Suragina*; S1 a short, strongly transverse, asetose band.]

*Hypopygium*. Epandrium, gonocoxites and cerci with long setae. Hypopygium (Fig. 4) broad, gonocoxites relatively short with arched lateral margins, joined ventrally by a narrow, sclerotised band constituting basal margin; inner

ventral side of each gonocoxite arches inwards basally and terminates in a medially-directed point, a narrow, finely setose, transverse area of membrane separating the two points from the band. Gonostyles (Fig. 5) remarkable in form, having a finger-like extension from base of the almost straight, quite slender main component, which expands apically into an irregular ovoid form with a preapical narrowing. Parameral sheath broadly subtriangular; two short, stubby points preapically on each side, one ventrolateral which is reflexed, and a lateral one which curves posterolaterally and is bluntly rounded; apex with fringe of stiff microsetae; tines strongly curved dorsad; ejaculatory apodeme broadly expanded, strongly keeled in midline; gonocoxal apodemes diverging as illustrated. Epandrium (Fig. 6) broadly subovate, cerci short and bluntly rounded.

**Female.** *Head*. Narrow in lateral view (Fig. 2), longest axis of eye almost vertical, much of eye surface located on anterior face with facets facing forwards; parafacials only very narrowly visible (sometimes not visible) in lateral view, genae not visible or only very narrowly so. Frons (Fig. 3) virtually parallel-sided over entire length, narrow, at midlength about one-fifth of greatest head width, smooth (without median ridge or furrow), shining apruinose over broad median section, lateral borders narrowly pruinose. Ocellar tubercle not visible in lateral view as vertex is slightly sunken, area behind tubercle curving immediately into occiput; ocelli almost in equilateral triangle, lateral ocelli placed close to upper eye margins. Antennae situated low, only narrowly separated from eye margin, first segment short, subannular, second segment a little longer, third segment subreniform, narrow above, somewhat flattened on ventral edge; style dorsal, slender, microsetose. Face deeply inset, small, dorsal bordering suture deeply impressed; in profile its anterior margin shallowly rounded, upper surface quite flattened; face projecting obliquely anteroventrally, clearly visible between palps in lateral view. Palps extended forwards, strongly arched on upper surface, slightly arched below, tapering to narrow apex, deepest near base; upper surface without setae, occupied by a sensory field of closely-packed chemoreceptor sensilla, elsewhere with stiff, brown setae. Proboscis stout, relatively short, less than height of head; stylets reaching to apex of labella. [In *Suragina*, ocellar tubercle further forwards on frons, lateral ocelli distant from upper corners of eyes by about length of tubercle; ocelli prominently visible in lateral view; eye usually more rounded in lateral view, but this condition variable between species; suture bordering face not so deeply impressed; dorsal margin of face more rounded in profile, not flattened; proboscis longer and more slender; palps chevron-shaped, strongly arched on both dorsal and ventral surfaces; extensive part of upper frons velvety-black.]

*Thorax*. As in ♂; legs generally as in ♂, apical spur of metacoxa elongate and pointed; femur 3 about  $1.3\text{--}1.5 \times$  length of femur 2 [ $1.5\text{--}1.8 \times$  in *Suragina*, intraspecifically variable].

*Wing*. Venation as in ♂; erect setae in row dorsally on  $R_{4+5}$ , basally on  $R_5$ , and on entire length of CuA; wing form sexually dimorphic, in ♀ anal lobe more gradually rounded,

hence not as broad. [In *Suragina* no setae present dorsally on veins mentioned; no sexual dimorphism in shape of anal lobe, or this very slight.]

**Abdomen.** Proportionately short, only slightly longer than thorax, maximum width at posterior margin of T2, about equal to width of thorax; T1 with roughly square, median basal depression which extends to hind tergal margin, this tergite produced anteriorly on each side into a broadly subconical projection, no median notch in hind margin or midline desclerotisation; T2 is longest tergite, T3 and T4 subequal, T5–7 progressively shorter and more transverse, T8 very short, only narrowly exposed, cerci very shortly exposed; S1 very narrow, bare. [In *Suragina* the basal depression relatively smaller, shallow, broadly subtriangular, short longitudinally and more distant from hind tergal margin; abdomen widest over T1; T1 divided in midline by a narrow longitudinal strip of pale, weakly sclerotised integument, hind margin often with shallow notch in midline.]

### *Suraginella macalpinei* n.sp.

Figs. 1–6

**Etymology.** Named in honour of the distinguished Australian dipterist, Dr David McAlpine.

**Type material.** HOLOTYPE ♂: [Queensland] Bertie Ck [Creek], 1 km SE / Heathlands H.S., Qld / 11°45'S 142°35'E / 23 Mar 1992 / G. Daniels, M.A. Schneider [in Queensland Museum, Brisbane, No. T57819]. PARATYPES: 17 ♂♂, 5 ♀♀, same data; 5 ♂♂, 2 ♀♀, Jardine R. Cape York / Pen. N.Qld / 11°08'S 142°35'E / 14 Oct. 1979 / M.S. & B.J. Moulds [G. Daniels Collection, Brisbane]. 1 ♂, West Claudie R. / Iron Range N. Qld. / 20 Sep. 1974 / M.S. Moulds; 2 ♂♂, Middle Claudie R. / Iron Range N. Qld. / 22 Sep. 1974 / M.S. Moulds; 1 ♂, Martin Creek / S. of Iron Range / N. Qld. / 24 Oct. 1974 / M.S. Moulds; 3 ♀♀, Claudie R. near / Mt Lamond, N. Qld. / 28 May 1966 / D.K. McAlpine; 1 ♀, Claudie R., 1 mile / W. Mt. Lamond, Qld. / 13 Dec. 1971 / D.K. McAlpine / G.A. Holloway / D. P. Sands.

### Description

**Male. Head.** Upper section of frons dull yellowish-brown in frontal view, lower section dark brown; entire frons and parafacials silvery-grey pruinose, colour shifting; antennal scape brown, pedicel and postpedicel pale yellow, all with thin, shifting, silvery pruinose; scape with short, dark bristles dorsally, pedicel fringed on outer apical edge with dark bristles; stylus very slender, brown. Face dark brown, thinly silvery pruinose. Palps dull yellowish-brown, paler on dorsal sensory area, with stiff, brown setae. Proboscis brownish with dark setae. Ocellar tubercle very dark brown, a group of stiff, erect setae posteriorly. Occiput shining silvery-grey, dorsally with dark velvet mark along eye margin, and with many shining white hairs. Genae with long brown hairs.

**Thorax.** Mesonotum dark brown, paler areas on humeral calli, postalar calli and transverse sutures; quite densely

covered with shifting greyish pruinose; scutellum dark brown, similarly pruinose, with many fine, brown setae. Pleura mostly dark brownish, pteropleuron more yellowish-brown; membranous area around anterior spiracle dull parchment yellow; mesopleuron with fine, soft, white hairs, sternopleuron bare; pleura generally with thin, shifting silvery-grey pruinose, less evident on paler parts. Fore legs: coxa and femur pale amber-yellow, coxae darker brown on outer surface, with fugitive silvery pruinose; femur fringed with long, dark, suberect hairs dorsally, some long hairs below and on posterior surface; tibia and tarsus with dense, small, suberect, brownish setae; tibia brown, tarsus darker brown. Middle legs: coxa brownish, with dark, bristly hairs anteriorly; femur amber-yellow, a poorly defined brown zone basally, with fine, brownish setae; tibia darker amber-yellow, with very small, dark setulae. Hind leg: coxa brown like adjacent pleura; femur bicolorous, whitish-yellow on a little less than basal half, brown apically, with many shining, brownish setae, these longer on upper surface; tibia and tarsus shining brownish, with strong, dark vestiture.

**Wing.** Strong smoky-brown pattern (Fig. 1), stigma darker brown, costal cell weakly brownish tinged; hyaline areas as illustrated. Halter knob dark brown, stem basally yellowish-brown.

**Abdomen.** Conspicuously bicolorous, appearing strongly banded; T1 entirely brown, T2 entirely dull yellowish, T3 dull yellowish transversely across short anterior section, remainder brownish, T4 like T3, other tergites and hypopygium brownish; all tergites with numerous, erect, dark setae.

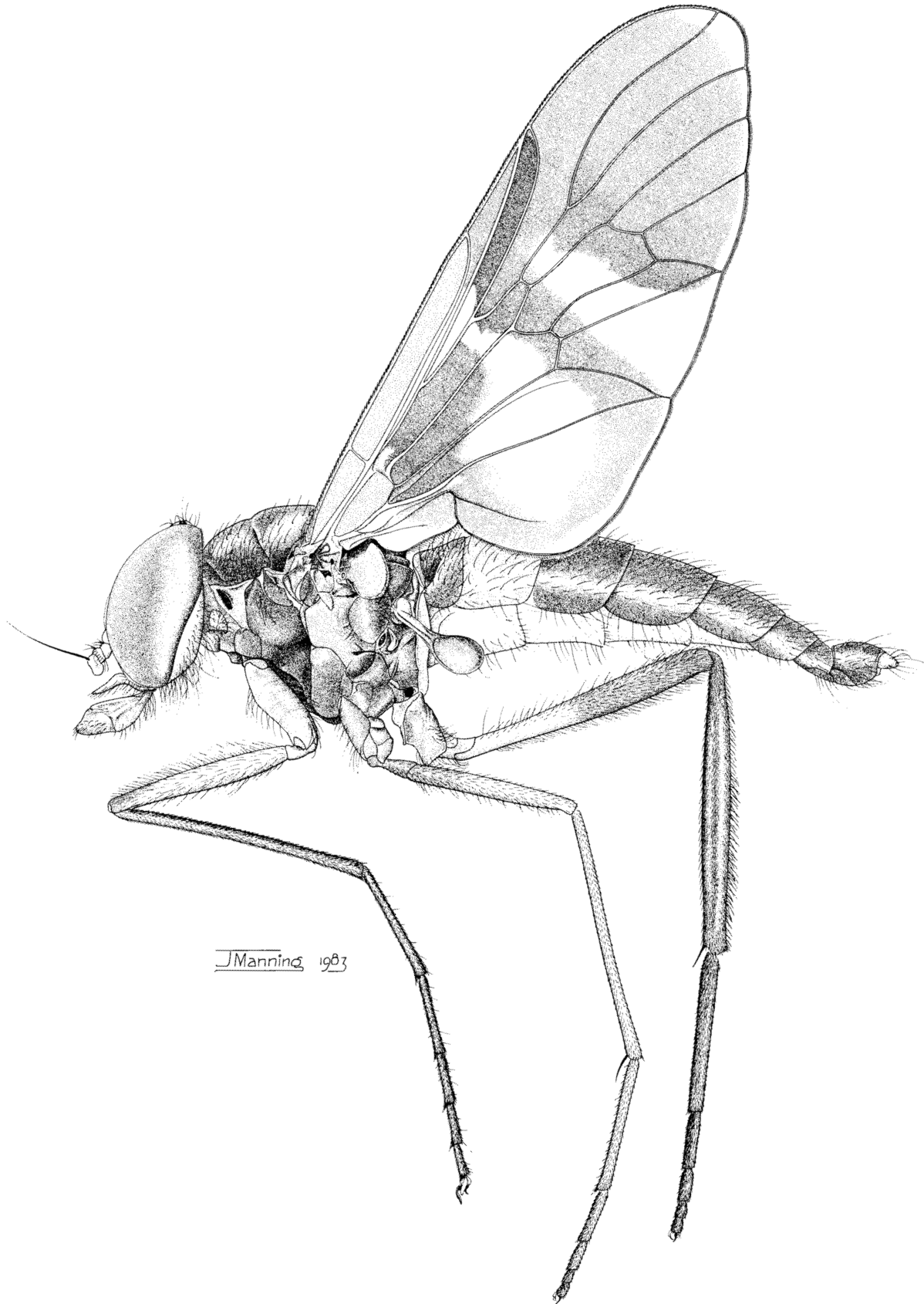
**Measurements.** Body length 6.0–6.5 mm; thorax length 2.0–2.3 mm; wing length 5.8–6.4 mm.

**Female. Head.** Frons shining blackish-brown, bordered laterally by narrow strip of pale, silky-yellow pruinose; silvery-grey pruinose above antennae and on parafacials, and some small, pale, porrect setae; ocellar tubercle with dark, erect bristles of irregular length; otherwise as in ♂.

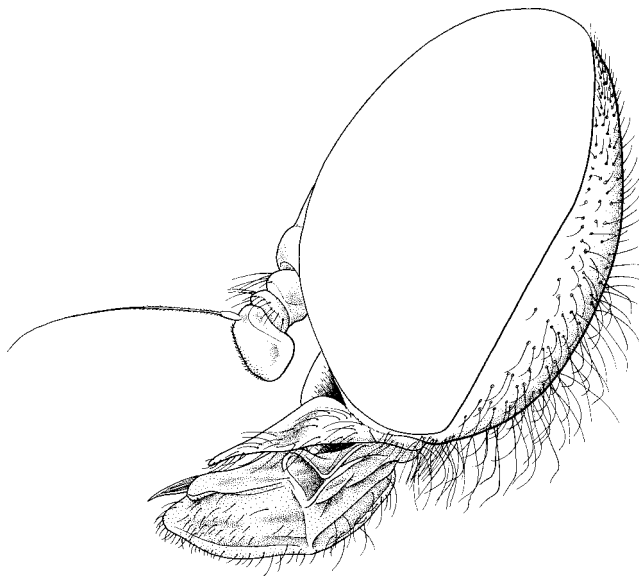
**Thorax.** Pronotum and humeri pale brownish-yellow; transverse sutures yellow-brown, elsewhere the mesonotum dark brown with some reddish tinting; fine, shifting, ashy-grey pruinose present, denser behind humeri and over prescutellar area and on anterior border of scutellum. Legs and wing pattern as in ♂.

**Abdomen.** Strongly banded as in ♂; T1 blackish-brown except warm golden-yellow on posterior border; T2 entirely golden-yellow, with some brownish tinge (probably due to postmortem changes in gut contents); T3 dark brown, except narrowly yellow along anterior border; T4 like T3 but not as dark and with an obvious paler area medially; remaining tergites dull brownish; vestiture pale, shining on T2, brown elsewhere.

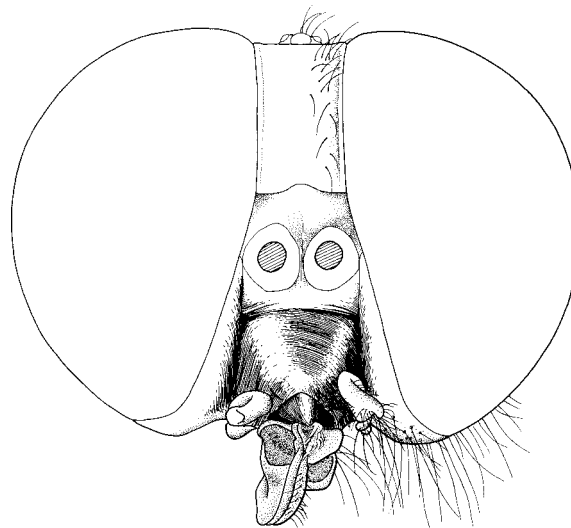
**Measurements.** Thorax length 1.7–2.5 mm; wing length 6.0–6.9 mm.



**Figure 1.** *Suraginella macalpinei* n.gen., n.sp. Male.



**Figures 2.** *Suraginella macalpinei* n.gen., n.sp. Female head in lateral view.



**Figures 3.** *Suraginella macalpinei* n.gen., n.sp. Female head in frontal view.

### Relationships

The comparison made above of *Suraginella* and *Suragina* makes it clear that the general similarity between them is illusory, and probably these genera are not closely related. Parts of the resemblance—notably the head form, robust proboscis, curved palpi, enlarged postpedicel, and elongate legs—are almost certainly associated with haematophagy and thus could be convergent (the probability that *Suraginella macalpinei* is a bloodsucker is discussed below). Several features of *Suraginella* appear to be apomorphies and warrant examination:

- Form of the gonostyle: the large basal extension (Fig. 5) is unique and an autapomorphy; other athericids have a simple, finger-shaped gonostyle.
- Cell  $m_3$  closed, stalked in some specimens (as in Fig. 1). In the athericine *Xeritha plaumanni* Stuckenberg, 1966 of Brazil, this cell is closed and long-stalked. The only other athericid I know to have  $m_3$  completely closed is an undescribed Peruvian species of “*Suragina*” (the generic status of the neotropical *Suragina*-like athericids requires reassessment). The condition is incipient in various Old World *Suragina* species that have  $m_3$  narrowed apically.
- Small, regularly spaced, erect setae are present dorsally in the female on much of  $R_{4+5}$ , the basal third approximately of  $R_5$ , and along the entire length of  $CuA$  (absent on  $CuA_1$  and  $CuA_2$ ). This sexual dimorphism is notable; it occurs also in the type series of *Xeritha plaumanni*.

Thus, on two counts—closed  $m_3$ , and dorsal setation of certain veins in the female—*Suraginella* and *Xeritha* share apomorphies, and a close relationship between them deserves consideration.

*Xeritha plaumanni* was described from Nova Teutonia in the southern Santa Catarina Province ( $27^{\circ}11'S$   $52^{\circ}23'W$ ).

I have since seen a series, now in the Natal Museum, with the following label data: [Brazil] Alto Itatiaia / Alt. 2000m / Rio Janeiro [approximately  $22^{\circ}30'S$   $44^{\circ}37'W$ ]. This new record shows that the species occurs widely in the old coastal highlands of SE Brazil. Apart from the original description, the only other reference to this genus is by Sinclair *et al.* (1993); they note that the gonocoxal apodemes, which are apomorphically elongate in Athericidae and Tabanidae, were illustrated by me as being very short in *X. plaumanni* (Stuckenberg, 1966, fig. 7). I have confirmed that they are short in a new dissection. Another autapomorphy, not previously noted though I inadvertently showed it in the drawing, is that the endoaegeal process (a term coined by Sinclair *et al.* for a sclerotised, pointed lobe projecting posteriorly from the end of the ejaculatory apodeme into the sperm sac) in *X. plaumanni* is in the form of a long slender rod, almost equal in length to the ejaculatory apodeme. In other athericids, as stated by Sinclair *et al.*, this process is reduced to a very short subtriangular point. The elongate form in *X. plaumanni* is thus secondary. These two hypopygial features set *Xeritha* apart from all other genera.

Although the condition of closed cell  $m_3$  is rare in Athericidae, it is probably unreliable for cladistic purposes as it would be a simple extension of a trend seen in several genera towards apical narrowing of that cell. The condition is also sporadic and rare in the sister-group Tabanidae, and clearly a consequence of homoplasy in isolated clades. In *Xeritha*,  $m_3$  is additionally distinctive in having a long stalk, suggesting the possibility of an independent development.

The setation of wing veins has not been examined in Athericinae before, although Malloch (1932), followed by Coscarón & Coscarón (1995), used the occurrence of these setae for defining subgenera in *Dasyomma*. The most complete setation occurs in *Dasyomma* s.str.; setae are present (in both sexes) on  $R_{4+5}$ ,  $R_5$ ,  $CuA$ ,  $CuA_1$  and  $CuA_2$ . In the other subgenera, the setae are variably absent on  $CuA$  and its branches, and on  $R_5$ . A survey of Athericinae produced the following results:

**A—setation present**

- *Succinatherix* Stuckenberg, 1974 (two fossil species, males unknown, in Baltic amber): setae present on  $R_{4+5}$ , basal part of  $R_5$ , and CuA, in *Succinatherix setifera* Stuckenberg; absent in *S. avita* Stuckenberg.
- *Atherix* Meigen, 1803, s.str. [species similar to *A. ibis* (Fabricius, 1798)]: setation usually sexually dimorphic, variable within and between species: present on  $R_{4+5}$  in ♀ *A. basilica* Nagatomi, 1958, ♀ *A. ibis ibis* (some populations), ♀ *A. ibis japonica* Nagatomi, 1958, ♂ *A. pachypus* Bigot, 1887, ♀ *A. lantha* Webb, 1977, ♀ *A. variegata* Walker, 1848; present on CuA in ♂ ♀ *A. ibis ibis* (variable, sometimes absent), ♂ ♀ *A. ibis japonica*, ♂ *A. pachypus*, ♀ *A. basilica*. The most complete setation was found in *A. ibis japonica*: ♂ entire CuA; ♀  $R_{4+5}$ , CuA,  $CuA_2$  basally.
- *Atrichops* Verrall, 1909: setae absent on CuA in both sexes; ♂ has setae on  $R_{4+5}$ , usually extending onto basal part of  $R_5$ ; in ♀ present on  $R_{4+5}$  and extending variably onto  $R_5$  (from short basal section to entire vein, differing between species).
- *Xeritha* Stuckenberg: type series, ♂ setae absent, ♀ on CuA,  $R_{4+5}$  except short basal section; Alto Itatiaia series, ♂ setae absent, ♀ setae absent on CuA, present on basal half of  $R_{4+5}$ .
- *Suraginella* n.gen.: ♂ setae absent; ♀ on CuA,  $R_{4+5}$  except short basal section,  $R_5$  over about basal third.

**B—setation absent**

- *Suragina* Walker; *Asuragina* Yang & Nagatomi, 1992, *Ibisia* Rondani, 1856, *Pachybates* Bezzi, 1926, *Trichacantha* Stuckenberg, 1955; several undescribed South African genera. All are in the Old World.
- “*Suragina*” species of northern Neotropical and southern Nearctic Regions.

There is no discernible way to polarise the character states of vein setation for cladistic analysis. It is unclear whether the most complete complement of setose veins was acquired as a single development, or if it was acquired progressively, the setae perhaps appearing first on  $R_{4+5}$  and later on CuA and its branches. Outgroup comparison with Tabanidae proved uninformative; there is no mention of such setose veins or use of them for taxonomic purposes, in modern faunistic monographs on Tabanidae worldwide. Dr Sixto Coscarón (in litt., 1999) informed me that in neotropical tabanids he has seen them only in some species in the primitive genera *Scaptia* Walker, 1850, *Mycteromyia* Philippi, 1865, and *Fidena* Walker, 1850. An examination of drawings of nearctic tabanid wings in Pechuman & Teskey (1981) revealed that *Pilimas californicus* (Bigot) (fig. 31.31) has setae basally on CuA, and *Diachlorus ferrugatus* (Fabricius) (fig. 31.38) has setae on CuA,  $CuA_2$ , and  $R_{4+5}$  basad of r-m. No reference to these conditions was made by the authors.

This limited evidence indicates that these setae evolved sporadically and independently in a minority of lineages of Athericidae and Tabanidae, and are of unknown phylogenetic significance. Those athericid genera listed above that have setose veins are a polyphyletic medley. The Baltic amber fossil

*Succinatherix setifera* reveals that setose veins were appearing in Athericidae as far back as the Eocene. No sister-group of *Suraginella* can be identified at present.

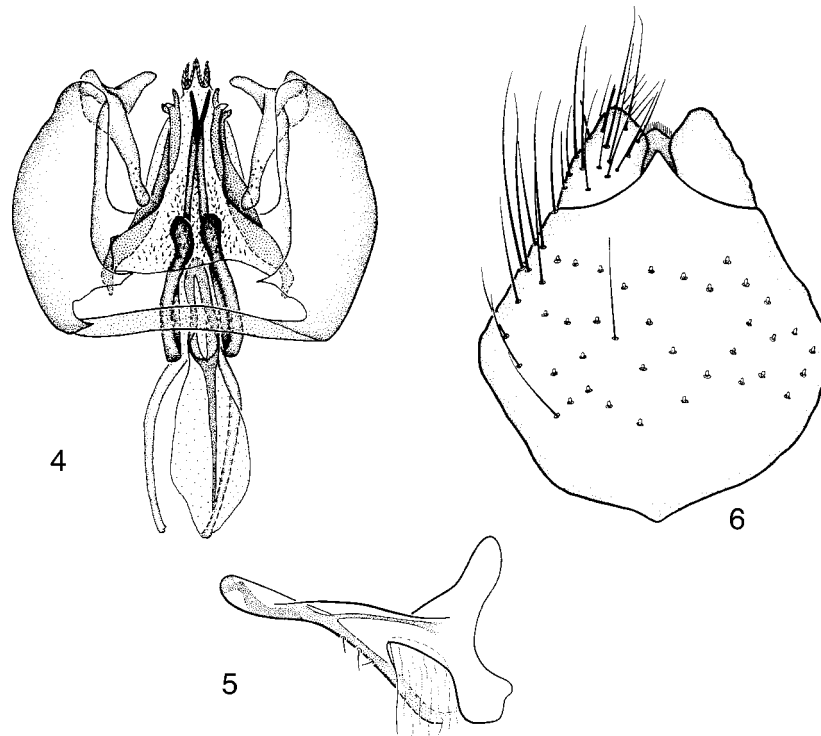
***Suraginella*—a bloodsucker?**

Several records exist of haematophagy by Athericidae; these have been mentioned in most reviews of the bloodsucking habit in Diptera (e.g., Downes, 1958). The following summary extends that by Nagatomi (1962):

- *Suragina longipes* (Bellardi): Man and horses in Mexico.
- *Suragina satsumana* (Matsumura): Cattle in Japan.
- *Suragina bivittata* (Bezzi): Giant Eagle Owl (*Bubo lacteus* Temminck) in South Africa (Stuckenberg & Young, 1973).
- *Atrichops crassipes* (Meigen): Frog (*Rana esculenta* L.) in Europe.
- *Atrichops fontinalis* (Nagatomi) and *A. morimotoi* (Nagatomi): Frogs (*Rana rugosa* Schlegel and *R. nigromaculata* Hallowell) in Japan.
- *Dasyomma coeruleum* Macquart and *D. humerale* Malloch: Cattle in Chile (F.W. Edwards, in Malloch, 1932: 200).

During fieldwork in Southern Africa, I have sometimes collected females of *Suragina monogramma* (Bezzi, 1926) with conspicuously red gut contents in the abdomen. Soon after the death of such specimens, the gut contents became blackish and formed a compact mass in the abdomen. It is highly probable that these flies had taken bloodmeals shortly before they were caught. I also observed such dark masses in the abdomen of museum specimens of various other Old World species of *Suragina*; it seems likely, in view of their well-developed mandibulate mouthparts, that the females of all species in this genus are bloodsuckers on vertebrate hosts. Nagatomi (1962) recorded his observations of the two Japanese species of *Atrichops* feeding on frogs; he noted that the gut contents of the flies were reddish immediately after the conclusion of feeding and changed to blackish. Nagatomi found also that oocyte development in these *Atrichops* species was inversely correlated with decrease in the volume of blood in the gut as digestion proceeded. Haematophagy thus appeared to be obligate in this genus.

Of the 12 females available of *S. macalpinei*, six have a dark mass in the abdomen. A test for the presence of blood was attempted by crushing the abdomen of one of them in normal saline solution; the mass was surprisingly hard and shattered into pieces of different sizes. Although the fly had been collected years before, the solution quickly acquired a brownish tinge. A drop was applied to the Blood section of a “Reagent Strip for Urinalysis” (“Multistix 9”—a proprietary product of the Bayer Company); this produced a weak positive reaction. One of the larger pieces, when well soaked in saline, was then placed directly on the strip; within 60 seconds it had produced a much stronger reaction rated “Moderate ++” on the colour scale provided with the strip. This suggests that the fly might have taken a bloodmeal from a vertebrate shortly before its death; however, such a crude test may give false positive results for a variety of reasons. Perhaps a dipterist visiting Cape York Peninsula can catch a



**Figures 4–6.** *Suraginella macalpinei* n.gen., n.sp. Male genitalia: 4—hypopygium in ventral view; 5—left gonostyle, ventral view; 6—epandrium, dorsal view.

specimen with reddish abdomen and immediately make a smear of the gut contents on a microscope slide. If erythrocytes are present, vertebrate blood will be confirmed; if they are nucleated, the host will have been a bird, frog or reptile.

### Biogeography

The distribution of athericids in general is determined by the requirements of the larvae which are rheophilic inhabitants of the beds of streams and rivers, where they prey on small invertebrates, each athericid species occupying a particular section of the river profile. The flies have substrate preferences; autogenous species usually rest on rock surfaces or low vegetation close to or bounded by the water flow, particularly in headwater zones, where they are relatively sedentary. Haematophagous species fly more actively and spread into riparian vegetation, probably impelled by the need to find hosts for bloodmeals; they tend to congregate on particular bushes, shrubbery or small trees, and may range further down river systems, some species of *Suragina* even occurring in riverine woodland along mature, slow-flowing rivers.

Present information is that *Suraginella* is known only from the far north of Cape York Peninsula, in the Iron Range/Claudie River system, and in the Jardine River system, but future collecting may extend this range. Information is lacking on the preferred habitat and section of river profile the species occupies. Collecting dates for the flies cover a wide period (September to May), which suggests permanence of water in the rivers they occupy.

Accounts of insect biogeography in Cape York Peninsula have focused on rainforest faunas. The extensive review by Kikkawa *et al.* (1981) describes how rainforests occur in three latitudinal zones for which the terms “base-of-peninsula”, “mid-peninsula” and “tip-of-peninsula” are established. It appears that *Suraginella* occurs in both “tip-of-peninsula” and “mid-peninsula” zones, but this may be misleading. The nature of riparian vegetation may have little relevance to athericid distribution; the flies are possibly indifferent to the presence of forest, although there may be some significance in the distribution of any vertebrates preferred for bloodmeals, should these be bound to the forest biome. Areas of sclerophyll habitats between the three rainforest regions are thus not necessarily a barrier to *Suraginella*, if they are traversed by rivers that flow regularly.

The faunal component to which *Suraginella* belongs is of interest. Its presence at Iron Range (“mid-peninsula”) and the Jardine River system (“tip-of-peninsula”), where many invasive New Guinea faunal elements have become established, raises the possibility that the genus occurs in New Guinea. Kikkawa *et al.* (1981), however, note that some freshwater components of the ancient “Gondwanic” element in Australia, today most diverse in the south, do occur in Iron Range and even in the tip of the peninsula. These are species of Gripopterygidae (Plecoptera) and *Archichauliodes* (Corydalidae: Megaloptera).

*Dasyomma* is clearly part of the Gondwanic element; its northernmost record is of an undescribed species in the “base-of-peninsula” Atherton Tableland (Paramonov, 1962: 153). If close affinities between *Suraginella* and *Xeritha*



had been found, *Suraginella* probably would be a member of the Gondwanic element. For the present, *Suraginella* is assumed to be another component of the extensive “Autochthonous” fauna of Australia, which developed in isolation from old ancestral stocks throughout the Tertiary (Kikkawa *et al.*, 1981). The distinction between “Gondwanic” and “Autochthonous” in Athericidae thus appears to be at the subfamily level. This is also the case in the palaeogenic dipterous family Blephariceridae; in my view (contrary to Zwick, 1977) its subfamily Edwardsiniinae is certainly Gondwanic. Perhaps there is biogeographical equivalence between *Suraginella macalpinei* and the blepharicerid *Theischingeria rieki* Zwick, 1998 which is highly distinctive, has no discernible relationships with any other Australasian Blepharicerinae, and is confined to “... only two streams flowing from the highest mountain in one of the largest areas of undisturbed rainforest remaining in Queensland” (the “base-of-peninsula” Mt Bartle Frere).

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