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Valeseguyidae, a new family of Diptera in the Scatopsoidea, with a new genus in Cretaceous amber from Myanmar

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Abstract. The genus *Cretoseguya*, **gen.n.**, is described for *C. burmitica*, **sp.n.**, based on a female found in mid-Cretaceous amber from Myanmar. *Valeseguya* Colless was classified previously as a subfamily of the 'woodgnats', family Mycetobiidae (Anisopodoidea). Thoracic and male terminalia morphology of *Valeseguya rieki* Colless, from the Recent of Australia, and *V. disjuncta* Grimaldi, in Miocene amber from the Dominican Republic, are redescribed. The new family Valeseguyidae includes two species in *Valeseguya* and one in *Cretoseguya*. Phylogenetic analysis of characters on the head, wing (venation), legs, terminalia and, especially, thoracic pleural sclerites indicate that the correct placement of the family is as the sister group to the 'scavenger gnats' Scatopsidae + Canthyloscelidae (including *Synneuron*). The concept and definition of Scatopsoidea are expanded to include these three families.

Introduction

The genus *Valeseguya* was described originally on the basis of a single, enigmatic male specimen from the state of Victoria, southern Australia (Colless, 1990). In his discussion of the systematic position of the genus, Colless (1990) placed *V. rieki* tentatively in the mycetobiine Anisopodidae on the basis of its unusual wing pattern. Colless (1990: 353) also considered the possibility of a relationship to bibionids on the basis of 'the complete absence of strong bristles or spines on the head, body, and appendages, and the general facies', and by 'the structure of the head and the position of the eyes'. He suggested a relationship to the Scatopsidae on the basis of the 'zig-zag shape of the pleural suture'. Grimaldi (1991) described *V. disjuncta* later, based on a large series of males and females in Miocene amber from the Dominican Republic (Fig. 1). Both species share distinctive apomorphies of the head, wing venation and male genitalia, and so there is little question about their close relationship. The Miocene species is known much better than the Recent one because of the large series of both sexes. This has revealed, for example, that the female terminalia of *Valeseguya* possesses a long, thin oviscape unique in the Diptera. In discussing relationships of the genus, Grimaldi (1991) indicated that it is possible to derive *Valeseguya* venation from an anisopodoid wing pattern, especially of the Mycetobiidae (a family often classified as a subfamily under Anisopodidae s.l.), but called attention to significant differences, such as the lack of macrosetae on the body as well as the relatively long antennae. Amorim & Tozoni (1995) presented a phylogeny of the Anisopodoidea, based mainly on wing features, in which *Valeseguya* was placed as the sister group to Recent Mycetobiinae, and proposed a new interpretation of wing vein homologies. The substantial differences between *Valeseguya* and the Mycetobiinae prompted them to raise the genus to a subfamily, the Valeseguyinae.

The discovery of a new species in Burmese amber (Grimaldi *et al.*, 2002) that is closely related to *Valeseguya* brought new interest to the systematic position of these enigmatic dipterans. A new genus is described here for this species, relevant details of both *Valeseguya* species are redescribed, and the phylogenetic position of the genera is considered.

Materials and methods

The holotype, paratypes and new specimens of the Dominican amber species *V. disjuncta* were re-examined,

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Fig. 1. *Valeseguya disjuncta* Grimaldi, in Miocene amber from the Dominican Republic.

together with the holotype of *V. rieki*, for comparison with the new species in Burmese amber. Preparation, observation and photomicrography techniques followed those described by Grimaldi *et al.* (2002). The types of *Valeseguya disjuncta* Grimaldi and *Cretoseguya burmitica*, **sp.n.**, are in the Division of Invertebrate Zoology at the American Museum of Natural History, New York and the holotype of *Valeseguya rieki* Colless is in the Australian National Collection, Canberra.

Table 1 lists the characters used to establish the relationships within the Scatopsoidea and relationships between the species of Valeseguyidae. Table 2 shows the data matrix, including outgroups used to root the analysis. Phylogenetic analysis was performed on a PowerMac G5 with PAUP version 4.0b10, using an exhaustive search and analysing all 34 459 425 possible trees. All characters were unordered and gaps were taken as missing entries.

Systematics

Valeseguyidae, fam.n.

Valeseguyinae Amorim & Tozoni, 1994: 533. Type genus: *Valeseguya*, by original designation.

Diagnosis. Flies with distinctive wing venation, possessing a single large basal cell, anal lobe highly reduced, vein R_{2+3} lost (features shared with Scatopsidae and Canthyloscelidae). Maxillary palps with one segment. Meron fused to thorax, pleural suture sigmoid. Female with long, thin, two-valved oviscape formed apparently from an elongate epiproct and hypoproct (females unknown for *V. rieki*). Gonocoxite digitiform, considerably developed posteriorly beyond the terminalia, gonostyle reduced to a small pair of sclerites or absent (male unknown in *Cretoseguya*).

Cretoseguya, gen.n.

Type species. C. burmitica, **sp.n.**

Diagnosis. Like *Valeseguya*, eyes large, mouthparts vestigial, maxillary palps one-segmented; oviscape long, slender, with two valves. Distinguished from *Valeseguya* by several plesiomorphic features: medial margins of eyes not emarginate; antennal flagellum with 13 flagellomeres; r-m present, M_{1+2} not fused to Rs. Medial fork present, veins M_1 and M_2 with a short, common stem. Veins m-m and M_3 apomorphically absent: M_1 ends at wing apex (vs. beyond), cubital fork short and close to wing margin.

Etymology. From Cretaceous, and Seguy. The stem of the type genus, *Valeseguya*, is a patronym for Eugene Séguy, late dipterist at the Museum National d'Histoire Naturelle in Paris.

***Cretoseguya burmitica*, sp.n.** (Figs 2, 3)

Holotype. Female, in amber from MYANMAR (BURMA): Kachin Province, northern Myanmar, approximately 105 km NW of Myitkyina; collected by D. Cruikshank, 1999 (Leeward Capital Corporation) (AMNH Bu108).

Description.

Head. Eyes large, extending from dorsal to ventral margins of head, with large frontal field, no dorsoventral differentiation of facets. Eyes bare, without setulae between facets. Medial margin of eye entire, not emarginate near bases of antennae. Three ocelli present, situated on a raised mound. Frons without setae [face collapsed, so details not discernible]. Palps broad but small, one-segmented as in *Valeseguya*. Occiput covered with setae. Antenna with 13 flagellomeres. Scape cylindrical, pedicel goblet-shaped; basal flagellomeres larger than more apical ones; last flagellomere tiny.

Legs. Elongate, coxae with normal setae; femora, tibiae and tarsi covered with small, scattered setae, with a row of longer setae ventrally along distal half of the tibiae and of the tarsi. First tarsomere much longer than other tarsomeres. Empodium not developed.

Table 1. Characters used in the phylogenetic analysis.

1	Maxillary palpus: (0) palpomeres elongate; (1) palpomeres short, stout, reduced in length (Fig. 8)
2	Maxillary palpus: (0) five-segmented; (1) four-segmented; (2) one-segmented (Fig. 8)
3	Flagellum: (0) with 14 flagellomeres; (1) with 13 flagellomeres; (2) with at most 12 flagellomeres; (3) with at most 10 flagellomeres (Fig. 8)
4	Tibial spurs: (0) present; (1) lost
5	Pleural suture: (0) straight; (1) sigmoid, katepimeron projected posteriorly at ventral half of the suture (Figs 4, 6, 8)
6	Medial and cubital wing veins: (0) normally sclerotized; (1) very lightly sclerotized, significantly less than radial veins (Fig. 7)
7	Sc: (0) complete, reaching C; (1) incomplete, not reaching C at wing margin (Fig. 7)
8	R_{2+3}: (0) present; (1) lost (Fig. 7)
9	bM: (0) complete, basal cell divided; (1) present at most as a small spur, basal cell large; (2) completely lost (Fig. 7)
10	A_1: (0) complete, reaching the wing margin; (1) incomplete (Fig. 7)
11	Anal lobe: (0) developed; (1) reduced (Fig. 7)
12	R_{4+5} ending: (0) at or close to the wing apex; (1) at least about one-third the distance between wing apex and R_1 (Fig. 7)
13	R_{4+5}: (0) forked, R_4 present; (1) simple, R_4 absent (Fig. 7)
14	First tarsomere: (0) slightly longer than distal tarsomeres; (1) longer than the sum of the four distal tarsomeres
15	Female terminalia: (0) oviscape absent or merely protrudent; (1) oviscape elongate, thin, flagellate (Fig. 2)
16	Gonocoxite: (0) basal to the gonostyle; (1) well developed distally, reaching beyond apex of the gonostyle, rather digitiform in shape
17	M_3: (0) present; (1) lost (Fig. 7)
18	m-m: (0) present; (1) absent (Fig. 7)
19	Eyes: (0) straight along inner margin; (1) emarginate at antennal bases (Fig. 8)
20	M_1: (0) independent from R_{4+5}; (1) basally fused to R_{4+5} (Fig. 7)
21	Flagellomeres: (0) cylindrical; (1) serrate (Fig. 1)
22	Base of Rs: (0) well developed; (1) short, veins closing the basal cell displaced to the base of the wing (Fig. 7)
23	Setal vestiture of thorax: (0) with setulae and macrosetae; (1) covered entirely with short, dense setulae, no macrosetae present (Figs 1, 8)
24	Antennal flagellum: (0) elongate, length generally 1.5× depth of head; (1) short, compact, length generally equal to or only slightly longer than head depth; flagellomeres with stems nestled in concave surface of proximal flagellomere (Fig. 8)

Thorax. Collapsed, details not observable. Post-pronotum only slightly developed, covered with setae. Fine setulae scattered over the scutum. Contact between epimeron I and katepisternum not observable. Meron clearly separate from coxa II, fused to the pleuron.

Wing. Sc extended to approximately midlength of wing, but apex not preserved (cannot determine if vein complete or incomplete); humeral crossvein incomplete, present as just a spur off Sc. R_1 long, very straight, ending at distal 0.78× length of wing; with setulae dorsally along portion distal to fork with Rs. R_{2+3} lost; R_{4+5} unbranched. Base of M very short, nearly perpendicular to r-m where it joins. M_1-M_2 forked, with very short stem. Crossvein r-m only slightly distal to base of M, nearly in line with bm-cu; crossvein bm-cu slightly longer. Cubital stem long, forked, displaced distally. CuA_1 arched away from CuA_2; anal lobe highly reduced. Large basal cell formed from stem of R and R_{4+5}, r-m, bm-cu and Cu, although base of Cu mostly obscured; a slight spur (bM) into distal part of cell, though this region somewhat obscured, no obvious vein bisects cell.

Abdomen. Female genitalia with long, fine oviscape, consisting of slightly bulbous base (0.35 mm long); 2 long, fine valves (c. 1.60 mm length) tapered distad, with mesal surface of each concave, both sides with fine setulae. Ventral valve [possibly the hypoproct, 'hypopygnal valve' in Grimaldi, 1991) ending with minute incision; apex of dorsal

Table 2. Data matrix for the characters used for a phylogenetic analysis of the Scatopsoidea and select nematoceran families.

	Character number																							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Pachyneuridae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanyderidae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Psychodidae	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	1	0	0	0	0	0	0
Anisopodidae	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
Trichoceridae	0	0	0	0	0	0	0	0	0	0	1	0	1	0	0	0	0	0	0	0	0	0	0	?
Axymyiidae	0	0	0	1	0	0	0	0	0	1	0	0	1	0	0	0	1	1	0	0	0	0	0	0
Canthyloscelidae	1	1	2	1	1	1	1	1	2	1	1	1	0	0	0	0	1	1	1	0	0	0	1	1
Scatopsidae	1	2	3	1	1	1	1	1	2	1	0	1	1	0	0	0	1	1	1	0	0	1	1	1
C. burmitica	1	2	1	1	1	0	?	1	1	1	1	1	1	1	1	?	1	1	0	0	0	0	1	0
V. rieki	1	2	2	1	1	0	1	1	1	1	1	1	1	1	?	1	0	1	1	1	1	0	1	0
V. disjuncta	1	2	2	1	1	0	1	1	2	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0

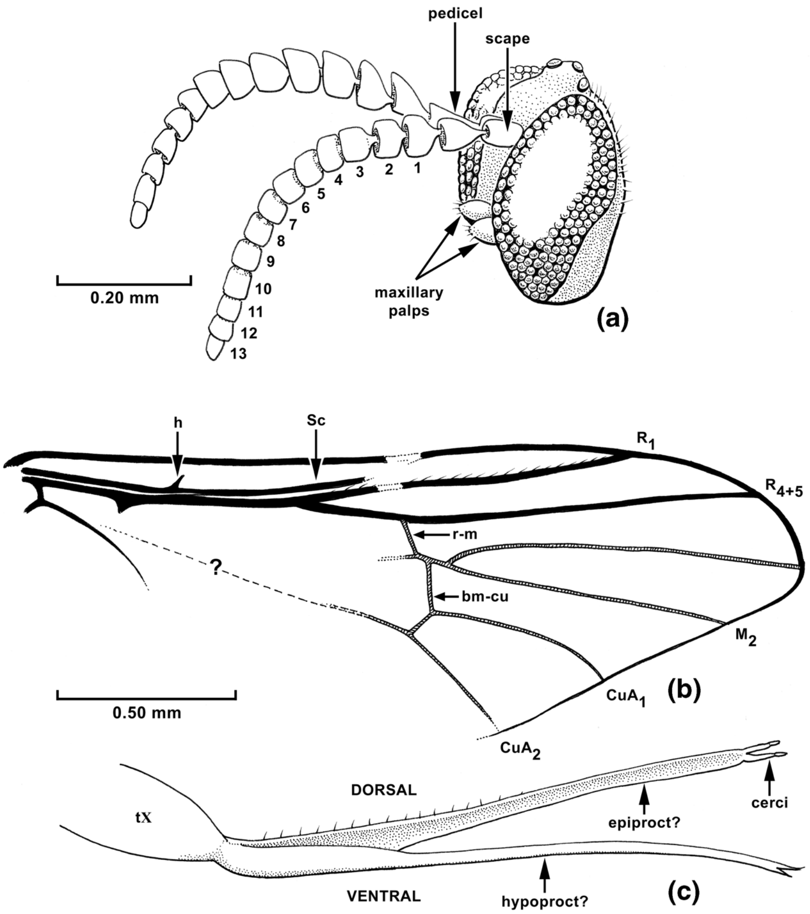

Fig. 2. *Cretoseguya burmitica*, **gen.n.**, **sp.n.**, in Cretaceous Burmese amber. a, Head. b, Wing. c, Female terminalia.

valve (possibly the epiproct, 'cercus' in Grimaldi, 1991) bifid, ending with a pair of minute articulated structures (most certainly these are the cerci); each cercus with 2 segments, the distal-most segment approximately half the length of basal one.

Measurements (in millimetres): total length of body, 2.5; total length of wing, 2.3. Fore leg: coxa, 0.25; trochanter, 0.13; femur, 0.45; tibia, 0.55; tarsomere 1, 0.35; tarsomere 2, 0.01; tarsomere 3, 0.08; tarsomere 4, 0.05; tarsomere 5, 0.08. Other leg articles with similar sizes.

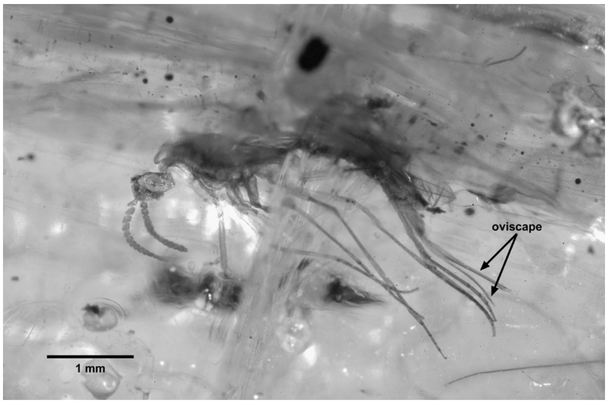

Fig. 3. Photomicrograph of *Cretoseguya burmitica* in Burmese amber.

Comments. The unique specimen is deeply embedded within a piece of amber containing many inclusions, thus precluding preparation close to the specimen. As a result, certain details are obscured, including the anal region of the wings and structure of the pleura. Other inclusions in the piece are three psychodids, three ceratopogonids, one cecidomyiid, one empidoid and one microhymenopteran.

There is no question that *Cretoseguya* is closely related to *Valeseguya* on the basis of some wing venation features, the reduced palps, the elongate first tarsomere and the bizarre oviscape, as described in the phylogenetic analysis. *Cretoseguya* appears to be an extinct sister group to the clade including the two species of *Valeseguya* as M_1 is not connected to R_{4+5} in *Cretoseguya*, but has rather a plesiomorphic medial fork. Also *Cretoseguya* has 13, nonserrate flagellomeres, as opposed to the 12 serrate flagellomeres in *Valeseguya*. Apomorphic features of *Cretoseguya* include the loss of M_3, the reduction in extension of R_{4+5}, the apical displacement of M_1 anteriad to the wing apex, and the displacement of the cubital fork to a more distal position in the wing.

Genus *Valeseguya* Colless

Valeseguya Colless, 1990: 351–353.

Type species. *V. rieki*. By original designation and monotypy.

Diagnosis (revised). Distinguished from *Cretoseguya* by the eyes emarginate at the base of the antennae, presence of 12 serrate flagellomeres, vein M_1 fused to R_{4+5}, and veins M_2 and M_3 connected directly to the basal cell.

Valeseguya disjuncta **Grimaldi** (Figs 1, 4, 5)

Redescription. The original description of *V. disjuncta* is detailed, and so redescription is provided here only of the thoracic pleural morphology and male terminalia.

Thorax. Antepronotum well developed posteriorly, bearing about 25 short setulae. Epimeron I sclerite elongated towards anterodorsal corner of katepisternum. Pleural suture sigmoid due to displacement of the katepisternum posteriorly and a projection of the mesepimeron anteriorly. Meron well sclerotized, entirely separated from mid coxa and clearly attached to pleural sclerites, suture defined, separated dorsally from mesepimeron. Meso-pleurotrochantin entirely absent. Laterotergite rather small, mediotergite short. Metepisternum well developed, metepimeron reduced to a slender vertical stripe.

Male terminalia. Gonocoxites especially large, extending beyond the rest of terminalia, not fused mesally. S9 present as small, triangular sclerite. Gonostyles apparently reduced to pair of slightly sclerotized, toothed sclerites just dorsal to gonocoxite margin in mesal position in the terminalia. Well-developed anterior sclerites correspond to sperm pump and related apodemes (not possible to observe in detail). Aedeagus with large ventral plate and pair of dorsal openings. Tergite 9 (epandrium) largely developed, more than twice the length of sternite 9; pair of cerci with group of 6–7 small, stiff setae dorsally and small setae ventrally.

Valeseguya rieki **Colless** (Fig. 6)

Redescription. Most details are in the original description, but some are worth comment. Thoracic morphology generally agrees with that of *V. disjuncta* except for the notable absence of any evident suture between anepisternum and katepisternum, and between meron and metepisternum. Pleural suture with distinctly sigmoid shape. Re-examination of the poorly preserved holotype confirmed the presence of well-developed gonocoxites in *V. disjuncta*, also present in *V. rieki*. Cerci present. Sclerites associated with sperm pump well developed but could not be observed in detail. Sperm pump well sclerotized, as also occurs in Canthyloscelidae and Scatopsidae, with ejaculatory apodeme and sperm pump arms well developed. An unusual, autapomorphic feature of the species is the incomplete veins R_1, M, and Cu, which do not reach to the wing margin.

Comments. This species is known only from the holotype, caught in a Malaise trap sample from Victoria, Australia (Colless, 1990). When it was retrieved from the sample, it was already slightly decomposed, and so the type of *V. rieki* is a very soft, poorly preserved specimen; it is entirely preserved in a small vial of glycerine. The genitalia of the type did not macerate well in 10% KOH.

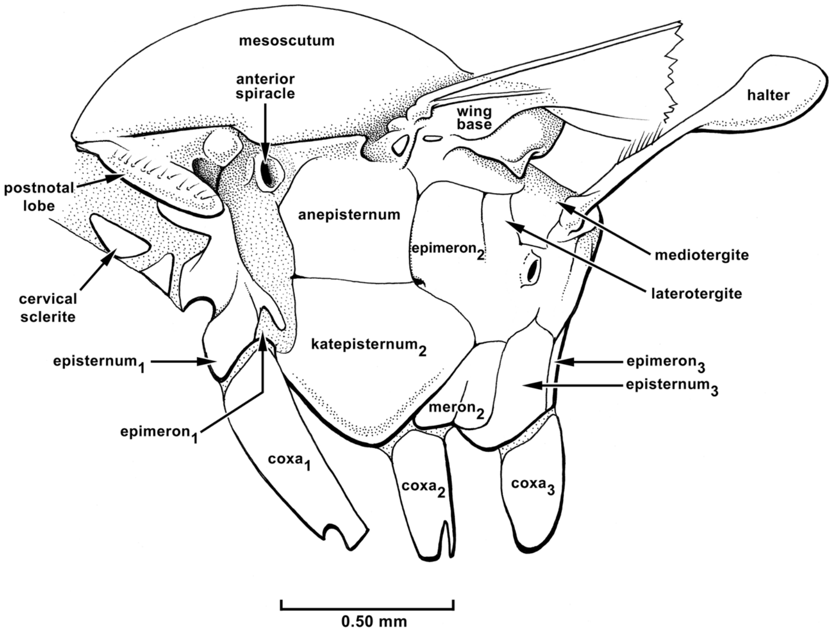

Fig. 4. *Valeseguya disjuncta*, thoracic pleural sclerites.

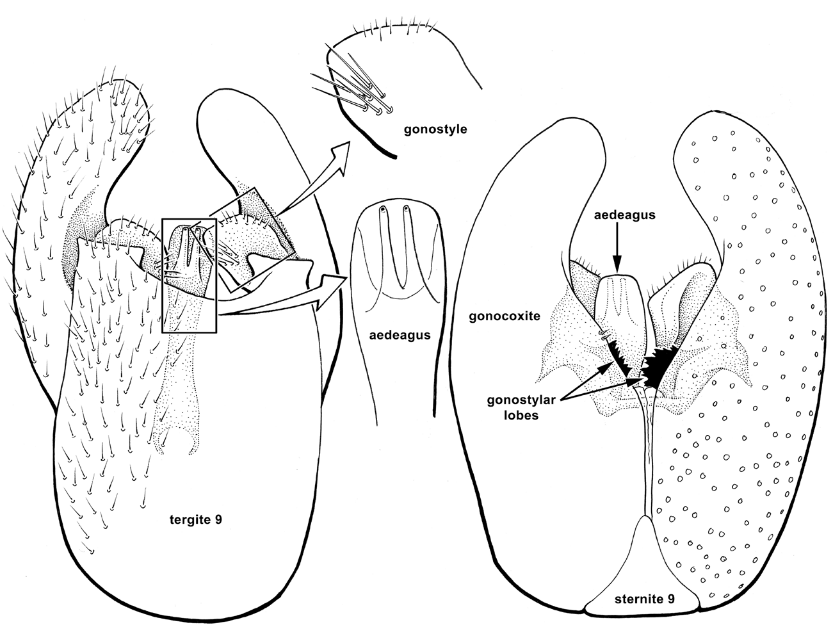

Fig. 5. *Valeseguya disjuncta*, male terminalia, dorsal view (left), ventral view (right) and details of the aedeagus and gonostyle.

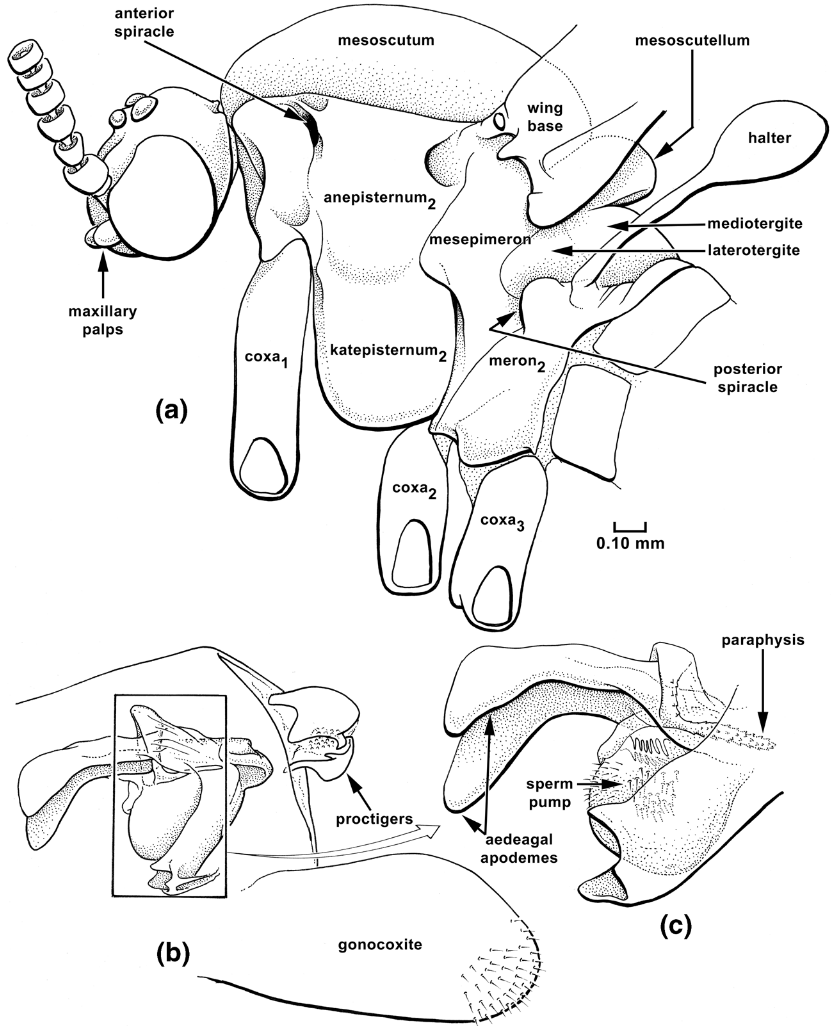

Fig. 6. *Valeseguya rieki* Colless. a, Thoracic pleural sclerites. b, Male terminalia, lateral view. c, Detail of sperm pump.

Phylogenetic placement of Valeseguyidae within Diptera

The inclusion of *Valeseguya* within the Anisopodoidea has been tentative since its description, as it was based mainly on features of the wing venation. *Mycetobia* and *Mesochria*, in particular, possess some vein reductions that allow – with some limitations – a derivation of the wing pattern seen in *Valeseguya*. The discovery of *Cretoseguya*, with its more plesiomorphic wing venation, and a restudy of the thoracic morphology of *Valeseguya*, however, indicate clear relationships between the Valeseguyidae and the clade composed of Canthyloscelidae + Scatopsidae. These families typically are assigned to the infraorder Psychodomorpha (Wood & Borkent, 1989; Amorim, 1994), but the monophyly and composition of this infraorder are still vague. Wood & Borkent (1989), for example, placed Anisopodidae in the Psychodomorpha (based mostly on larval characters), whereas Oosterbroek & Courtney (1995) placed it as the sister group of the Brachycera.

A single shortest tree of 36 steps (ci 0.78, ri 0.87) was obtained (Fig. 7). Our analysis was not an exhaustive study of nematocerous families, but could properly test the

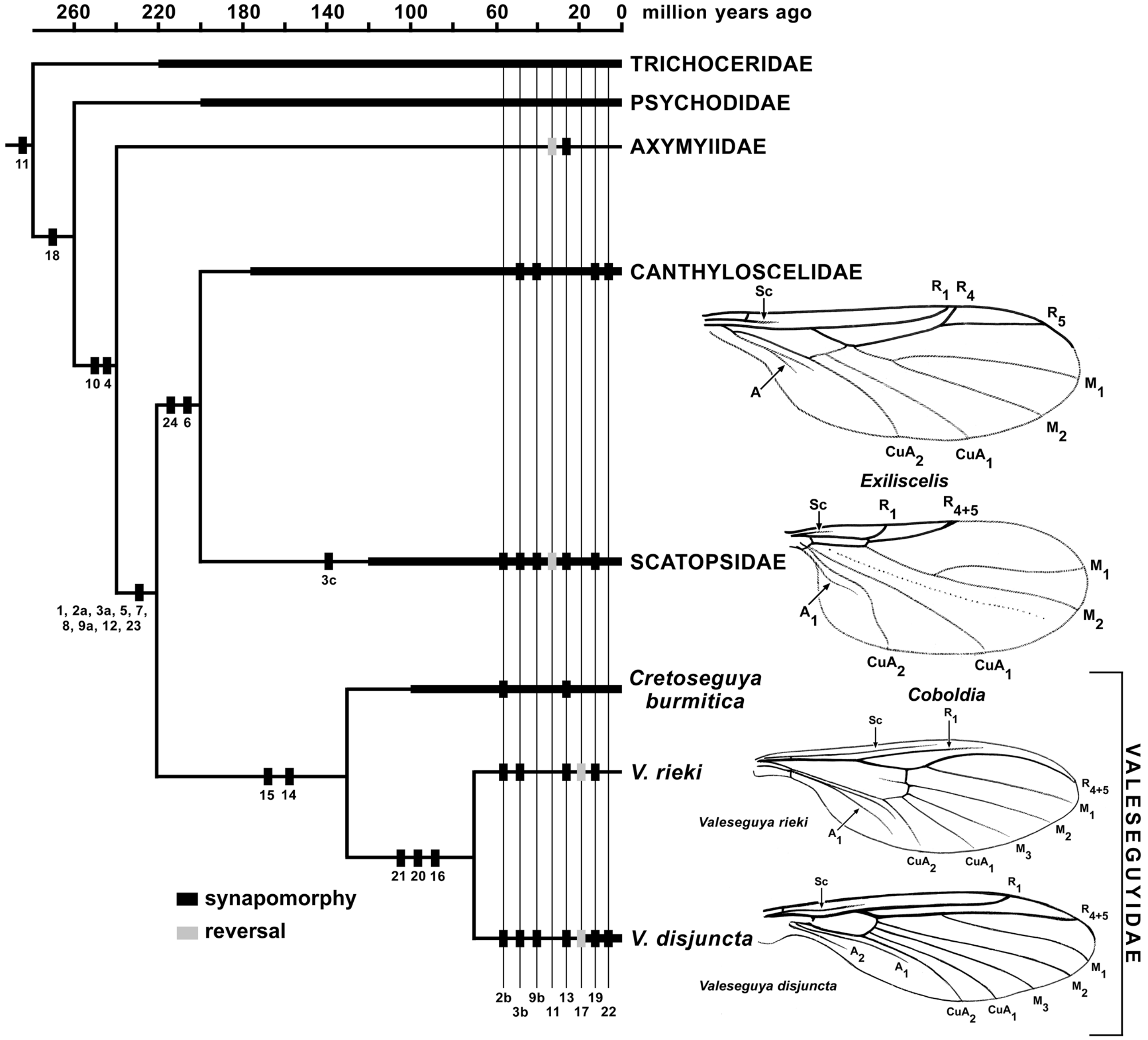

Fig. 7. A phylogeny of the Scatopsoidea based on an analysis of the characters in Tables 1 and 2, with wing venation of representative scatopsoids. Thick lines along the length of the geological column indicate the known extent of the fossil record for the terminals included in the analysis. Characters with unique origin in the cladogram are placed at the nodes of the clades and characters with multiple origin at the top.

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monophyly of the Scatopsoidea, including the Valeseguyidae. The results indicate that all three scatopsoid families are defined strongly as a monophyletic group on the basis of nine unique characters. Even with a limited taxon sampling, the inclusion of Anisopodidae and Pachyneuridae sufficiently demonstrates the exclusion of Valeseguyidae from the Bibionomorpha. The shortest tree confirms Scatopsidae and Canthyloscelidae as sister groups, and Valeseguyidae as the sister group to these two families. *Cretoseguya* clearly is an extinct sister group to the living and Miocene species of *Valeseguya*.

Perhaps the most relevant character to be considered here is the detachment of meron 2 from the mesocoxa and its fusion to the pleural thoracic sclerites, not seen in any Bibionomorpha including the Anisopodoidea. This feature occurs in the families Scatopsidae (Fig. 8) and Canthyloscelidae (including *Synneuron*, sometimes placed in its own family; but see Amorim, 2000), as well as in Axymyiidae, Blephariceridae, Brachycera, Perisomma-tidae, Ptychopteridae, Tanyderidae and Trichoceridae. *Valeseguya* has a complete detachment of the meron from the coxa, fused to the pleuron, displacing the metapleural sclerites posteriorly. This feature is itself sufficient to exclude the family from the Bibionomorpha and from the Anisopodidae in particular.

Several other features, moreover, support a relationship of Valeseguyidae with the other two families of Scatopsoidea. In the original genus description, Colless (1990) called attention to the zig-zag shape of the pleural suture. Indeed, the plesiomorphic condition of the suture, at the contact between episternum II and epimeron II, is straight and vertical. Among the early diverging families of

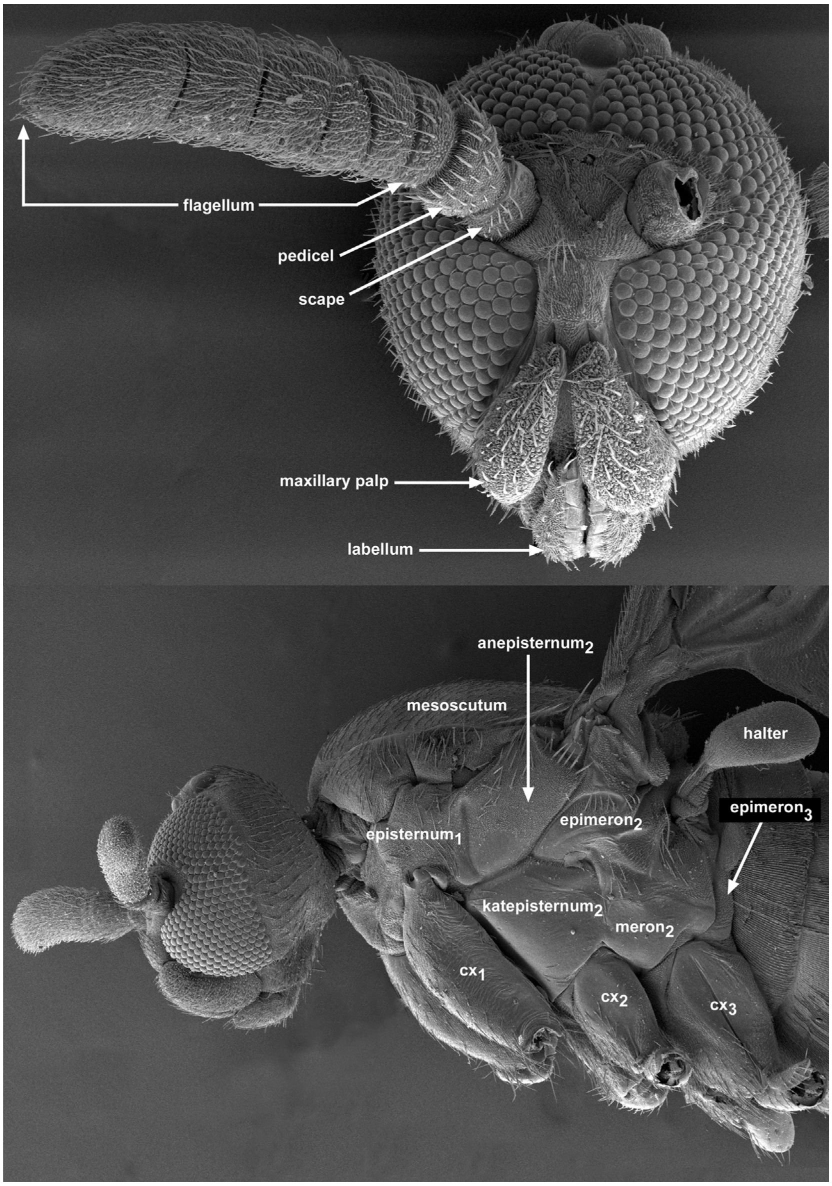

Fig. 8. Scanning electron micrograph of the head (frontal view) and head and thorax (lateral view) of a typical scatopsid, *Coboldia fuscipes* Meigen 1830. cx, coxa.

Diptera, only Scatopsidae and Canthyloscelidae share with Valeseguyidae this unique displacement of the posterior margin of the katepisternum to a more posterior position, resulting in a 'folding' of the pleural suture. The similarity of this feature in the Archizelmiridae (Grimaldi *et al*., 2003) is superficial, and placement of this family in a higher position within the Bibionomorpha has been corroborated recently by Hippa & Vilkamaa (2005). A well-developed sperm pump and associated apodemes occur in a few nematoceran families. The development found in the Canthyloscelidae and Scatopsidae, however, has a parallel only in *Valeseguya* (also, in scatopsids, it is detached from the terminalia, floating in the abdomen). Moreover, the shape of the ejaculatory apodeme and the 'crest' around the base of the sperm pump, found in Scatopsidae and Canthyloscelidae, resemble that of *Valeseguya*.

This new placement of Valeseguyidae in the Scatopsoidea better explains the highly modified wing venation of the former group. Hennig (1954, 1973) placed the Scatopsoidea within the Bibionomorpha, close to the 'fungus gnats' (Sciaroidea), based mainly on wing venation, particularly the loss of bM, forming a large basal cell. In the phylogeny of the Canthyloscelidae (Amorim, 2000), the loss of bM was assumed to be convergent among Sciaroidea, Mycetobiidae and Scatopsoidea. The reduced size of the anal lobe may be another feature linking the Canthyloscelidae, Scatopsidae and Valeseguyidae, pending decisions about outgroups. Psychodidae do not possess an anal lobe, but closely related families in the Psychodomorpha, such as the Tanyderidae, have a well-developed anal lobe. The highly reduced anal lobe in Canthyloscelidae is very similar in shape to that of valeseguyids, whereas most Scatopsidae have a more developed anal lobe. It is provisionally interpreted here that the anal lobe is reduced in the ground plan of the Scatopsoidea, with a secondary development in Scatopsidae (Fig. 7). Additional features connecting the Valeseguyidae with Scatopsidae + Canthyloscelidae are a reduction in the size of the maxillary palpomeres (e.g. Fig. 8), loss of one palpomere from the most plesiomorphic condition in Diptera of five palpomeres, an incomplete vein Sc and loss of vein R_{2+3}. The loss of the tibial spurs in Valeseguyidae occurred in parallel to the situation in scatopsids and *Canthyloscelis*, although reduction in spur size may be synapomorphic for these taxa.

Putative scatopsids are from the late Jurassic Karabastau Formation of Kazakhstan, but, although these compression fossils are consistent with the Scatopsidae, they lack the preservation of key features that allow definitive assignment to this family (D. A. Grimaldi, unpublished data). The earliest definitive scatopsids are Ectaetiinae in Early Cretaceous amber from Lebanon, with slightly younger ones in the mid- to Late Cretaceous ambers from Myanmar, New Jersey, and Canada. Most significant is *Prohyperoscelis rohdendorfi* from the mid-Jurassic of Siberia, which is embedded within a phylogeny of Recent canthyloscelid genera (Amorim, 2000). As such, divergence of scatopsids and canthyloscelids must have been in the early Jurassic, and, by inference, the Valeseguyidae as well.

The Valeseguyidae thus far are known from a few distant spots around the world: in the Cretaceous of Myanmar, the Miocene of the Dominican Republic and the Recent of Queensland, Australia. Clearly, they were once global and even rather abundant in Dominican amber. Oddly, as yet, there is no record in other, prolific amber deposits from the Cretaceous throughout the Northern Hemisphere (Grimaldi & Engel, 2005) or the huge deposits of Eocene Baltic amber.

References

Amorim, D.S. (1994) A new suprageneric classification of the Scatopsidae (Diptera: Psychodomorpha). *Iheringia Zoologia*, **77**, 107–112.

Amorim, D.S. (2000) A new phylogeny and phylogenetic classification for the Canthyloscelidae (Diptera: Psychodomorpha). *Canadian Journal of Zoology*, **78**, 1067–1077.

Amorim, D.S. & Tozoni, S.H.S. (1995) Phylogenetic and biogeographic analysis of the Anisopodoidea (Diptera, Bibionomorpha), with an area cladogram for intercontinental relationships. *Revista Brasileira de Entomologia*, **38**, 517–543.

Colless, D.H. (1990) *Valeseguya rieki*, a new genus and species of dipteran from Australia (Nematocera: Anisopodidae). *Annales de la Societé Entomologique de France*, **26**, 351–353.

Grimaldi, D.A. (1991) Mycetobiine woodgnats (Diptera: Anisopodidae) from the Oligo-Miocene amber of the Dominican Republic, and Old World affinities. *American Museum Novitates*, **3014**, 1–24.

Grimaldi, D., Amorim, D.S. & Blagoderov, V. (2003) The Mesozoic family Archizelmiridae (Diptera: Insecta). *Journal of Paleontology*, **77**, 368–381.

Grimaldi, D. & Engel, M.S. (2005) Evolution of the Insects. Cambridge University Press, New York/Cambridge.

Grimaldi, D.A., Engel, M.S. & Nascimbene, P.C. (2002) Fossiliferous Cretaceous amber from Myanmar (Burma): its rediscovery, biotic diversity, and paleontological significance. *American Museum Novitates*, **3361**, 1–72.

Hennig, W. (1954) Flügelgeäder und System der Dipteren unter Berücksichtigung der aus dem Mesozoikum beschriebenen Fossilien. *Beiträge zur Entomologie*, **4**, 245–388.

Hennig, W. (1973) Diptera (Zweiflügler). *Handbuch der Zoologie, Bd. 4: Arthropoda, 2. Hälfter: Insecta, 2. Aufl., 2 Teil Spezielles* (ed. by J. G. Helmcke, D. Starck and H. Wermuth). Walter de Gruyter, Berlin.

Hippa, H. & Vilkamaa, P. (2005) The genus *Sciarotricha* gen.n. (Sciaridae) and the phylogeny of the recent and fossil Sciaroidea (Diptera). *Insect Systematics and Evolution*, **36**, 121–144.

Oosterbroek, P. & Courtney, G. (1995) Phylogeny of the nematocerous families of Diptera. *Zoological Journal of the Linnean Society*, **115**, 267–311.

Wood, D.M. & Borkent, A. (1989) Phylogeny and classification of the Nematocera. *Manual of Nearctic Diptera*, **Vol. 3** (coordinated by J. F. Mcalpine and D. M. Wood), pp. 1333–1370. Research Branch, Agriculture Canada Monograph 32, Ottawa.

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