

Revision of Afrotropical *Polypedilum* Kieffer subgen. *Uresipedilum* Sasa et Kikuchi, 1995 (Diptera: Chironomidae), with a review of the subgenus

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Keywords : Diptera, Chironomidae, Afrotropical, *Polypedilum* subgen., *Uresipedilum* Sasa et Kikuchi, keys, new species, revisions.

Subgeneric diagnoses are given for all stages of the subgenus *Uresipedilum*. Sasa et Kikuchi, 1995 of *Polypedilum* Kieffer, 1912. A key to the male imagines of the Afrotropical members of the subgenus is given. A phylogenetic analysis based on all available material of *Uresipedilum* from all zoogeographical regions is presented. The subgenus can be divided into three distinct groups, with additional species of uncertain placement. The *annulatum* group consists of five Afrotropical species with two Nearctic species as their sister group. The *convictum* group shows East Asian - Nearctic vicariance with four Japanese, one Nearctic and Japanese, one Nearctic and one Palaearctic and Oriental species. The *oresitrophum* group shows a multiple sister group relationship within a Gondwanian lineage with three Afrotropical species, three species from New Zealand, and one species from Australia.

Ten new Afrotropical species are described: *P. (U.) dossenudum* sp. n. as male imago, pupa and larva; *P. (U.) plautum* sp. n. and *P. (U.) lehmanni* sp. n. as male imagines and pupae ; and *P. (U.) spinibojum* sp. n., *P. (U.) praegnans* sp. n., *P. (U.) harrisoni* sp. n., *P. (U.) freemani* sp. n., *P. (U.) acutululum* sp. n., *P. (U.) kakumense* sp. n., and *P. (U.) gladysae* sp. n. as male imagines only. *P. (U.) annulatum* Freeman, *P. (U.) kibatiense* Goetghebuer and the European *P. (U.) convictum* Walker are redescribed as male imagines. Two species, *P. (P.) ephippium* Freeman and *P. (P.) anderseni* sp. n. belonging to the nominal subgenus *Polypedilum* are described or redescribed.

Révision des *Polypedilum* Kieffer afrotropicaux du sous-genre *Uresipedilum* Sasa et Kikuchi, 1995 (Diptera : Chironomidae), avec une revue du sous-genre

Mots-clés : Diptera, Chironomidae, région afrotropicale, *Polypedilum* subgen., *Uresipedilum* Sasa et Kikuchi, clés, nouvelles espèces, révisions..

Des diagnoses subgénériques sont données pour tous les stades du sous-genre *Uresipedilum* Sasa et Kikuchi, 1995 de *Polypedilum* Kieffer, 1912. Une clé des imagos mâles des espèces afrotropicales du sous-genre est donnée. Une analyse phylogénétique basée sur l'ensemble du matériel disponible d'*Uresipedilum* de toutes les régions biogéographiques est présentée. Le sous-genre peut être divisé en trois groupes distincts, avec certaines espèces à position incertaine. Le groupe *annulatum* comprend 5 espèces afrotropicales voisines avec 2 espèces néarctiques parentes. Le groupe *convictum* montre une vicariance néarctique - Asie orientale avec 4 espèces japonaises, une espèce néarctique et japonaise, une espèce néarctique et une espèce paléarctique et orientale. Le groupe *oresitrophum* montre une relation multiple du groupe parent dans la lignée Gondwaniennne avec 3 espèces afro-tropicales, 3 espèces de Nouvelle Zélande et une espèce d'Australie.

10 nouvelles espèces afro-tropicales sont décrites : *P. (U.) dossenudum* n. sp. au stade imago mâle, nymphe et larve ; *P. (U.) plautum* n. sp. et *P. (U.) lehmanni* n. sp. au stade imago mâle et nymphe ; et *P. (U.) spinibojum* n. sp., *P. (U.) praegnans* n. sp., *P. (U.) harrisoni* n. sp., *P. (U.) freemani* n. sp., *P. (U.) acutululum* n. sp., *P. (U.) kakumense* n. sp. et *P. (U.) gladysae* n. sp. seulement au stade imago mâle. *P. (U.) annulatum* Freeman, *P. (U.) kibatiense* Goetghebuer et l'espèce européenne *P. (U.) convictum* Walker sont décrites au stade imago mâle. Deux espèces *P. (P.) ephippium* Freeman et *P. (P.) anderseni* n. sp. appartenant au sous-genre *Polypedilum* sont décrites ou redécrites.

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1. Introduction

The larvae of *Polypedilum* are found in all standing and flowing waters, except at high latitude and altitude. The larvae of most species occur in sediments, with a few species mining wood or grazing epilithic and epilithic surfaces.

The genus is known from all zoogeographical areas except Antarctica. In the Afrotropical region it is the dominant genus with 39 of 415 species registered in the Afrotropical Catalogue (Freeman & Cranston 1980) and several more are under description. Fittkau & Reiss (1979) mention that there at that time were 81 known Neotropical species of the genus of which only one was described. Recently Bidawid & Fittkau (1995) and Bidawid (1996) described 51 of these species. About 230 species have been described on a world wide base and about 50 more are known, but not as yet described. This makes *Polypedilum* probably the largest of all chironomid genera.

The genus *Polypedilum* in the adult stage forms a clearly distinct and easily recognisable group of species. Adults can be recognised by the deeply bifid pulvilli combined with the triangular shaped eighth abdominal segment. The immatures form less easily distinguishable groups. The genus has been divided into six subgenera *Polypedilum s. str.* with two species groups, the *nubeculosum* and the *nubifer* group, *Pentapedilum* Kieffer, *Tripodura* Townes, *Uresipedilum* Sasa et Kikuchi, *Asheum* Sublette et Sublette, and *Cerobregma* Sæther et Sundal. The genus *Collartomyia* Goetghebuer only with some reservation deserves generic status (Sæther & Sundal 1997).

The recently erected subgenus *Uresipedilum* apparently is well defined in the adult and larval stage. Some pupae, however, have a dorsal seta on the anal lobe like in *Tripodura* and *P. nubifer*. Clearly this subgenus, as well as the subgenera *Polypedilum s. str.*, *Pentapedilum* and *Tripodura*, is in need of redefinition and delimitation.

The subgenus *Uresipedilum* was erected by Sasa & Kikuchi (1995) for the *Polypedilum convictum* group sensu Niitsuma (1992). However, the name was first used without a description and *Uresipedilum* Sasa & Okazawa (1991), thus was *nomen nudum*. The *convictum* species group of the genus *Polypedilum* Kieffer, 1912, was first erected by Lenz (1941) for those species characterised by the pupae having 4-6 small branches in their thoracic respiratory organ, the larvae having the second medium mentum teeth smaller than the first and third, and the two larval eye spots fused on each side of the head.

Several new species were found in material from Ghana collected by the team of the NUFU (Norwegian Universities' for Development and Research and Education) project. Other new species were recognised in material collected by the University of Bergen research team in the West Usambara mountains in North East Tanzania, borrowed material from Natal Province in South Africa, Zoologisches Staatssammlung, Munich in Germany and The Natural History Museum (British Museum).

2. Material, methods and morphology

Morphological nomenclature follows Sæther (1980) with the additions and corrections given in Sæther (1990). The broad, lamellate setae of the pupae are named taenia in accordance with Langton (1994). Measurements are given as ranges followed by a mean when 4 or more measurements are made, followed by the number measured in parentheses (n).

In the figures of the male hypopygia the dorsal aspect is shown to the left, the ventral aspect and the apodemes to the right.

The holotypes of the species collected in Tanzania and Ghana and paratypes of most of the other species are deposited at the Museum of Zoology, University of Bergen, Norway (ZMBN). The types of *P. (U.) annulatum* Freeman, *P. (U.) spinibojum* sp. n., *P. (U.) praegnans* sp. n., *P. (U.) freemani* sp. n. and *P. (U.) harrisoni* sp. n. are returned to The Natural History Museum (British Museum), London, England (BMNH), together with paratypes of some of the other species. The holotype of *P. (U.) kibatiense* Goetghebuer and its synonym *P. stilatus* Freeman is returned to the Koninklijk Museum voor Midden-Afrika, Tervuren, Belgium. The holotype of *P. (U.) lehmanni* sp. n. is returned to Zoologisches Staatssammlung, Munich, Germany (ZSM), together with some paratypes of other species.

3. *Polypedilum* Kieffer

List of synonyms as in Sæther & Sundal (1998).

Type species: *Polypedilum pelostolum* Kieffer, 1912 (= *Chironomus nubifer* Skuse, 1889), by subsequent designation of Ashe (1981 : 58)

Diagnosis. As in Pinder & Reiss 1983, 1986, Cranston et al. 1989, Sæther 1977, and Oyewu 1997. The diagnoses can be emended in several minor aspects based on the descriptions below and on Bidawid & Fittkau (1995), Bidawid-Kafka (1996), and Sæther & Sundal (1998). However, since several other groups of the

genus are under description a more complete diagnosis should be postponed.

Systematics. A preliminary phylogenetic analysis of the genus as a whole with keys to subgenera and species groups is presented by Sæther & Sundal (1998). The subgenus *Uresipedilum* Sasa et Kikuchi is shown probably to be form either the sister group of the remainder of the genus or of an emended subgenus *Tripodura* Townes (Sæther & Sundal 1998, Bjørlo, Vårdal & Sæther 1998).

4. *Polypedilum* subgenus *Uresipedilum* Sasa et Kikuchi

Polypedilum subgenus *Uresipedilum* Sasa et Kikuchi, 1995 : 119.

Polypedilum subgenus *Uresipedilum* Sasa et Okazawa, 1991 : 54, *nomen nudum*.

Type species : *Chironomus convictum* Walker, 1856 : 161 [= *Polypedilum convictum*] by present designation.

[Sasa & Kikuchi (1995) did not designate a type species, but mention that their new subgenus is identical to the *cultellatum* or the *convictum* group. Accordingly *P. cultellatum* Goetghebuer or *P. convictum* (Walker) should be designated as the type species. *P. convictum* with well developed posterior lobes as larva is the more typical member of the subgenus, although the Nearctic specimens may belong to a species different from the European specimens [*P. flavum* (Johannsen)] according to Epler (1995 : 7.95).]

Diagnostic characters : The adult males can be separated from the other subgenera by having the basal portion of the superior volsella much longer than wide, and in most cases almost covered by microtrichia ; apicomedial projection of superior volsella arising from the inner margin of the base and directed inwards ; anal tergal band weakly developed of H type or in a few cases absent ; median anal tergite setae present ; and wing vein R_{2+3} evanescent and almost in contact with R_1 .

The pupae fall into two groups, with or without dorsal taeniae on the anal lobe. When dorsal taeniae set towards inner edge of anal lobe are present conjunctive V/VI either is without a spinule band or, when such a band is present, tergites II and III lacks a median point patch ; the spinules on conjunctives III/IV and IV/V are as conspicuous as the caudal hooklets of tergite II. In the other group, without dorsal setae on the anal lobe, conjunctive III/IV either is without spinules ; or when spinules are present the cephalothorax either has a distinct tubercle anterior to the base of the wing sheath and tergite II nearly completely covered with prominent spinules ; or when the tubercle is absent the ante-

rior row of spinules on tergite II is nearly absent or weak with spinules at most slightly larger than the shagreen spinules ; or when the anterior spinules on tergite II are stronger the anal spur is a weakly curved spur with few and small points.

The larva are distinguished by having the four median teeth set off from the rest of the mentum and in contact with the anteriorly produced median ends of the ventromental plates, and usually well developed posterior lobes on the ventromental plates.

4.1. Diagnosis

IMAGO

Small to medium sized species, wing length 1.0-3.3 mm. Abdomen pale yellow to various dark brown stripes on segments ; dark brown apices or banded. Thorax pale yellow to dark brown with various coloration patterns on vittae, preepisternum, postnotum, anteprototum, and scutellum ; dark brown spots on postnotum, anteprototum, preepisternum or almost completely dark brown or black. Wings clear. Legs pale yellow, yellow, or yellowish brown ; some with dark brown femora and/or tarsi apices.

Antenna. Antennal ratio usually higher than 1. Males with 13, females with 5 flagellomeres.

Head. Eyes bare, frontal tubercle absent. Third palpomere bearing 2-5 short blunt-tipped sensilla clavata subapically. Tentorium without microtrichia. Temporals consisting of inner verticals, outer verticals and postorbitals.

Thorax. Anteprototum reduced, widely separated, without setae. Scutal tubercle absent. Acrostichals numerous, long, and biserial ; dorsocentrals long, few to many, in single row ; prealars few. Scutellum with few to many setae, uni- to multiserial. Supraalar absent ; preepisternum and anepisternum bare.

Wing. Membrane without setae. R_1 and R_{2+3} almost parallel ; R_{2+3} evanescent ; R with few to many setae ; R_1 with few to many setae ; R_{4+5} with many or occasionally few setae ; RM and M mostly bare, or occasionally with a few setae. Squama with few to several setae. Brachiolium with 1 seta.

Legs. Fore tibial scale rounded or triangular, with or without apical spine, spine preapical in *P. (U.) tesfayi* Harrison only. Mid and hind tibiae with broad, unspurred anterior comb separated from posterior (narrower) comb with elongate spur, occasionally combs fused. Sensilla chaetica probably always absent. Pulvilli present and well developed.

Abdomen. Densely setose with long setae.

Hypopygium. Anal tergal bands moderately developed, fused basal to median anal tergite setae ; slightly delimited area of long median anal tergal setae ; weaker apical anal tergite setae present lateral to anal point. Anal point variable, but often narrow, tapered apically to nearly parallel-sided apex. Superior volsella with well developed base, with or without microtrichia ; with 2-4 inner setae, but setae absent in a few cases ; and 1-4 apical setae ; with digitiform, medially directed extension. Inferior volsella mostly parallel-sided or late-

rally broadened subapically, microtrichiose with apical, long seta directed posteriorly arising from tubercle. Gonocoxite commonly narrowed midway with outer margin gradually tapering to rounded apex. Gonostylus with outer margin gradually tapering and broadest in middle, apex usually with short seta on tubercle; inner margin more or less straight with few setae.

Female genitalia. Not described.

PUPA

Small to medium sized pupae, 1.0-3.3 mm long. Exuviae pale brown to brown or black with margins of wing sheath golden brown, mesal paratergital margins of segments VI-VII and caudal spur brown.

Cephalothorax. Frontal setae, if present long, on short conical tubercle. Cephalic tubercles barely indicated or forming low humps. Frontal apotome smooth or very slightly wrinkled laterally. Prealar tubercle absent, weakly developed or occasionally distinct.

Abdomen. Tergite I without spinules and shagreen; II-VI and occasionally VII with relatively large anterior rows of spinules; II (III)-VI with relatively strong extensive median and posterior band of shagreen [*P. (U.) convictum*, *P. (U.) flavum* and *P. (U.) aviceps* Townes without shagreen on tergite II]. Tergite VII and VIII with weak and small patches of shagreen, spinules if present small and usually arranged in rows; IX bare. Tergite II with coarse or occasionally small caudal hooklets. Conjunctives III/IV, IV/V and occasionally V/VI may bear uniserial to irregular biserial similar spines. Pedes spurii A may be present on segment IV and occasionally on V and VI or absent. Pedes spurii B well developed on segment II or on both I and II. Sternites usually bare, occasionally sternite I or II with weak shagreen or spinules. Segment VIII with posterolateral (anal) comb or spur bearing 1 large spine and usually 0-3 or several lateral teeth, occasionally composed of few spines.

Abdomen. Segment II-IV with 1-3 hair-like L setae, V and VI with 3, VII and VIII with 4 L setae, all normally taeniate.

Anal lobe well developed, usually with complete fringe of medium to long taeniae confined to posterior half, dorsal taenia absent or when present set towards inner edge of lobe.

LARVA

Small to medium sized larvae, 4.7-7.0 mm long. Head capsule yellowish brown with postoccipital margin of mentum and mandible brownish black.

Antenna. Five segmented. Basal antennal segment with ring organ near base. Antennal segment 3 shorter than 4; Lauterborn organ usually just reaching apex of antennal segment 3, occasionally shorter or longer. Blade usually shorter, occasionally longer than flagellum.

Labrum. S I moderately expanded laterally towards apex, apex filamentously branched; S II narrow, more or less distinctly branched on both sides. Labral lamella well developed. Pecten epipharyngis usually distinctly divided into 3 platelets, each with well developed teeth.

Mandible. Dorsal tooth dark brown, similar in colour to apical tooth and 3 inner teeth. Seta subdentalis well developed. Seta interna usually consisting of 4 main branches with numerous branches. Pecten mandibularis with numerous secondary filaments. Mola occasionally with spines.

Mentum. Four median teeth of mentum set off from rest of mentum and in contact with anteriorly produced median ends of ventromental plates, 6 pairs of lateral teeth. Inner median tooth taller than outer median tooth, first lateral tooth high followed by remaining progressively shorter lateral teeth, or median mental teeth all approximately of same size and lateral teeth decreasing uniformly laterally. Ventromental plates with well developed posterior lobes or when posterior lobes barely indicated or absent antennal blade longer than flagellum and outer median teeth of mentum much smaller than median teeth and first lateral teeth, or mola with spines.

Body. Anal lobe more or less well developed. Claws of posterior parapods all simple. Procercus short, bearing medium to long anal setae. Anal tubules well developed.

4.2. Systematics

The subgenus *Uresipedilum* of the genus *Polypedilum* occurs in all the six zoogeographical regions. Up to now twenty-one species has been described from all zoogeographical regions (Table 1).

For *P. (U.) aviceps*, *P. (U.) convictum*, *P. (U.) flavum*, *P. (U.) cultellatum*, *P. (U.) oresitrophum*, *P. (U.) paraviceps*, *P. (U.) dossenudum* and *P. (U.) surugense* all stages are known. Male imagines and pupae are known from *P. (U.) lehmanni*, *P. (U.) plautum*, *P. (U.) microzoster* and *P. (U.) tesfayi*. The remaining species are known only as imagines. This, of course, makes both a parsimony analysis and a manual analysis tentative and difficult.

The parsimony analysis used PAUP version 3.1.1 and Mc-Clade on a Macintosh IIsi. Most searches were heuristic due to the high number of question marks and polymorphies, but when species with unknown immatures were eliminated branch and bound could be used.

For the parsimony analysis the following trends were used: IMAGINES

- T 1. WL less than 2.0 mm (0), WL more than 2.0 mm (1).
- T 2. Abdomen uniformly pale, pale yellow to yellow, greenish, brown or blackish (0); abdomen with segment apices dark (1); abdomen distinctly banded (2); segment VI or VII-IX dark (3).
- T 3. Thorax pale yellow or yellow (0), thorax with 3 dark spots (1), thorax with various dark patches (2), thorax almost totally dark (3).
- T 4. Legs unicoloured (0); with darker markings at coxae, femora or tarsi apices (1).
- T 5. AR more than 1 (0), less than 1 (1).
- T 6. Scutellum with 3-6 setae (0), with 7-11 setae (1), with 12 or more (2).
- T 7. Wing vein R_{2+3} relatively well separated from R_1 (0), almost in contact with R_1 (1).
- T 8. R_{4+5} more than 29 (0), with 9-29 (1).

Table 1. List of previously described species of *Polypedilum* subgen. *Uresipedilum* Sasa & Kikuchi.

Tableau 1. Listes des espèces de *Polypedilum* subgen. *Uresipedilum* Sasa et Kikuchi décrites antérieurement.

Palaeartic species:

- aviceps* Townes, 1945:61; Japan, Nearctic.
convictum (Walker, 1856: 161); Oriental.
cultellatum Goetghebuer, 1931: 212; Holarctic incl. Algeria.
hiroshimaense Kawai et Sasa, 1985; Japan.
kibatiense Goetghebuer 1936: 487; Israel, Afrotropical.
paraviceps Niitsuma, 1992: 703; Japan.
pedatum Townes, 1945: 55; Japan, Nearctic.
surugense Niitsuma, 1992: 700; Japan.
tamasesusi Sasa, 1983: 15; Japan.

Nearctic species:

- aviceps* Townes 1945: 61; widespread Canada, USA, Japan.
cinctum Townes 1945: 59; Oregon, California, Nevada, Virginia.
cultellatum Goetghebuer, 1931: 212; California, Palaeartic.
flavum (Johannsen, 1905: 225); Nearctic. (= *convictum* auct. nec Walker, *obtusum* Townes, 1945: 60)
pedatum Townes, 1945: 55; widespread Canada, USA, Japan.
suliceps Townes, 1945: 58; widespread USA

Australasia and Oceania species:

- albicorpum* Tokunaga, 1964: 593; Micronesia.
canum Freeman, 1959: 434; New Zealand.
cumberi Freeman, 1959: 434; New Zealand.
oresitrophum (Skuse, 1889: 247); Australia.
harrisi Freeman, 1959: 433; New Zealand.

Oriental region:

- convictum* (Walker), 1856: 161); China, Palaeartic.

Neotropical species:

- microzoster* Sublette et Sasa, 1994:43; Guatemala.
pseudoconvictum Bidawid-Kafka, 1996: 200; Peru.

Afrotropical species:

- annulatum* Freeman, 1954: 22; South Africa.
convictum sensu Lehmann nec Walker. (= *plautum* sp. n.); South Africa, Zaire.
ephippium Freeman, 1958: 292; *pro parte* (= *freemani* sp. n.); Sudan.
kibatiense Goetghebuer 1936: 487; Zaire, Senegal, Sudan, Uganda, Zimbabwe, South Africa, Israel.
tesfayi Harrison 1996: 80; Ethiopia.

The species *Polypedilum* (*Polypedilum*) *sabbuhi* Bidawid-Kafka, 1996: 200, from Guyana possibly could belong in the subgenus *Uresipedilum*. However, unlike other *Uresipedilum* it has a long spur on the tibial scale of the front leg.

- T 9. Setae present on M (0), absent (1).
 T 10. Squama with more than 7 (0), with 2-7 (1).
 T 11. Fore tibial scale with subapical spur (0), scale rounded, triangular or with apical spur (1).
 T 12. Fore tibial scale with apical spur (0), triangular without spur (1), rounded without spur (2).
 T 13. LR_1 less than 2 (0), more than 2 (1).
 T 14. Superior volsella with low base and apicomedian projection (0), with large base and apicomedian projection (1), with large base and no projection (2).
 T 15. Projection of superior volsella at least as long as 1/2 total length of volsella (or absent) (0), between 1/2 and 1/3 the length (1), between 1/3 and 1/4 (2).
 T 16. Base of superior volsella without basal swelling and small hook-shaped projection (0), with basal swelling and small hook-shaped projection as in Fig. 17 C, D (1).
 T 17. Superior volsella with distinct usually broad base and well set off projection (0); base slender, projection not well set off, as in Fig. 12 H (1).
 T 18. Base of superior volsella with apex nearly straight (0), rounded (1), with pronounced heel (2).
 T 19. Superior volsella with microtrichiae (0), without (1).
 T 20. Base of superior volsella either covered with microtrichiae or completely bare (0), microtrichiae present both basally and apically, but with microtrichiae-free areas (1); microtrichiae present at base only (2), microtrichiae at apex only (3).
 T 21. Base of superior volsella with 4 inner setae (0), with 3 (1), with 2 or less (2), without (3).
 T 22. Base of superior volsella with 1 apical setae (0), with 2 or more (1).
 T 23. Inferior volsella parallel-sided (0), laterally broadened subapically (1).
 T 24. Median setae on tergite IX less than 10 (0), more than 9 (1).
 T 25. Anal tergite bands absent (0); weak, not fused basal to median anal tergite setae (1); fused basal to setae (2).
 T 26. Anal point parallel-sided or tapering (0), slightly spatulate at apex (1).
 T 27. Anal point not conspicuously broadened (0), conspicuously broadened (1).
 T 28. Setae along apical inner margin of gonostylus short, not different from more basal setae (0); setae longer and differentiated (1); setae extremely long and well differentiated (2).

PUPAE

- T 29. Cephalic tubercles normal to strongly developed (0), reduced to low humps (1), absent (2).
 T 30. Frontal setae long (0), short (1), absent (2).
 T 31. Prealar tubercle absent (0), present (1).
 T 32. Tergites II-VI without anterior, transverse band of spines or spinules (0); tergites II-VI and sometimes VII with anterior transverse band or row of spines or strong spinules (1); tergite II with small spinules reduced to anterior and posterior band, tergites III-VI with relatively large anterior band of spinules and tergite VII-VIII with very small spinules usually arranged in rows (2).

- T 33. Tergites II without shagreen, tergites III-VI with extensive band of shagreen (0); tergites II-VI with extensive median and posterior band of shagreen consisting of moderately developed spinules, and sometimes VII-VIII with weakly developed shagreen at the anterior corners (1).
 T 34. Conjunctive III/IV with spinules (0), without (1).
 T 35. Pedes spurii A present (0), absent (1).
 T 36. Anal spur single with or without accessory teeth (or absent) (0), anal comb present (1).
 T 37. Anal spur or comb with few teeth (0); comb compound, with numerous teeth or spinules (1).
 T 38. Anal lobe fringe with more than 20 taeniae (0), with less (1).
 T 39. Anal lobe fringe with less than 25 taeniae (0), with 25-45 taeniae (1), with more than 45 taeniae (2).

LARVA

- T 40. Antennal segment 3 relatively long, longer than or only slightly shorter than 4 (0); shorter, distinctly shorter than 4, or when not, segment 4 also reduced (1).
 T 41. Lauterborn organs reaching midpart of antennal segment 3 or beyond (0); Lauterborn organs small, indistinct or absent (1).
 T 42. Blade shorter than flagellum (0), longer (1).
 T 43. Mentum with all mental teeth decreasing in size approximately uniformly laterally, or all approximately of the same size or mentum with median tooth slightly taller than first lateral tooth which are slightly shorter than second lateral tooth followed by the remainder of short lateral teeth (0); mentum with tall median tooth taller than first lateral tooth which is shorter than second lateral followed by progressively shorter lateral teeth (1).
 T 44. Ventromental plates with well developed posterior lobes (0), posterior lobes not well developed or barely indicated (1).
 T 45. Distance between ventromental plates at most about as long as combined width of 4 median teeth (0), distance between ventromental plates at least about as long as combined width of 6 median teeth (1).
 T 46. Median teeth or first lateral teeth of mentum in contact with anteriorly produced apicomedian ends of ventromental plates (0), median ends of ventromental plates pointing posterior or towards each other (1).

A data matrix is given in Table 2. The genus *Phae-nopsectra* is used as outgroup and the subgenus *Tripodura* as well as other *Polypedilum* (i.e. excluding *Uresipedilum* and *Tripodura*) also included. The scoring of the data is somewhat ambiguous as for most extralimital species they are based on the literature and some scorings are rather subjective. For instance Freeman (1959, 1961) in his diagnoses for *Polypedilum* mention that the fore tibial scale is armed with a short spine. For *P. (U.) oresitrophum*, however, he specifically mentions that the fore tibial scale apparently is unarmed. It is thus assumed that the remaining species of *Uresipedilum* from New Zealand and Australia have a spine on the front tibial scale.

Table 2. Character matrix used for the parsimony analysis (T 1-45) of the relationships within the subgenus *Uresipedilum* Sasa et Kikuchi.
 Tableau 2. Matrice des caractères d'analyse de parcimonie (T 1-45) des relations phylogénétiques à l'intérieur du sous-genre *Uresipedilum* Sasa et Kikuchi.

Trends	1	2	3	4	5	6	7	8	9	10	11	12
<i>acutulum</i>	0	0	1	0	1	0	1	1	0	0	1	0
<i>albicorpum</i>	0	0	0	0	0	1	1	?	?	0	1	2
<i>annulatum</i>	0&1	2	3	0	0	2	1	0	0	0&1	1	1&2
<i>aviceps</i>	0&1	0	2	1	0	2	1	0&1	0	0	1	2
<i>canum</i>	1	1	2	1	0	?	1	?	1	?	1	0
<i>cinctum</i>	1	3	2	0	0	2	1	0	1	0	1	2
<i>convictum</i>	0&1	0	0	1	0	2	1	?	1	0	1	2
<i>cultellatum</i>	0&1	0	2	0	0	2	1	0	1	0	1	2
<i>cumberi</i>	1	0	3	0	1	?	1	?	1	?	1	0
<i>dossenuidum</i>	0	1	3	0	0	1	1	1	1	0&1	1	2
<i>flavum</i>	0&1	0	0	1	0	2	1	0	1	0&1	1	2
<i>freemani</i>	0	3	2	1	0	0	1	1	1	1	1	0
<i>gladysae</i>	0	0	1	0	0	0	1	1	1	1	1	0
<i>harrisi</i>	1	3	2	1	0	?	1	?	1	?	1	0
<i>harrisoni</i>	0	2	3	0	0	0&1	1	1	1	0&1	1	0
<i>hirosimaense</i>	0	0	2	1	0	2	1	?	1	0&1	1	2
<i>kakumense</i>	0	0	1	0	0	1	1	1	1	0	1	2
<i>kibatiense</i>	0	0	2	0	0	1	1	1	1	1	1	0
<i>lehmanni</i>	1	0	0	0	0	?	1	0	0	0	1	2
<i>microzoster</i>	0	2	0&1	1	0	2	1	1	1	0	1	2
<i>oresitrophum</i>	0	1	3	1	1	?	1	?	1	0	1	2
<i>paraviceps</i>	0&1	0	2	1	0	2	1	?	1	0	1	2
<i>pedatum</i>	0&1	0	3	0	0&1	2	1	0&1	1	0	1	2
<i>plautum</i>	1	0	1	0	0	2	1	0	1	0	1	2
<i>praegnans</i>	0	2	3	0	0	0	1	1	1	1	1	2
<i>pseudoconvictum</i>	0	0	3	0	0	0	1	?	?	?	1	2
<i>spinibojum</i>	1	0	3	0	0	1&2	1	0	0	0	1	2
<i>suliceps</i>	0&1	3	3	0	0	2	1	0&1	1	0	1	2
<i>surugense</i>	0	0	2	1	0	2	1	?	1	0	1	2
<i>tamasemusi</i>	0	0	3	0	0	1&2	1	?	1	0&1	1	0&1
<i>tesfayi</i>	1	0	1	0	0	2	1	0	0	0	1	0
<i>Tripodura</i>	0&1	0	0	1	0&1	0&1&2	0	?	1	0&1	0	0&1
<i>Polypedilum</i>	0&1	0	2&3	1	0&1	0&1&2	0	0&1	1	0&1	0	0&1
<i>Phaenopsectra</i>	1	0	3	0	0	2	0	0&1	0	0	0&1	0&1

Using the full data matrix with trends unordered yields more than 4000 trees each with 267 steps and a strict consensus tree (Fig. 1 A) showing *Uresipedilum* as monophyletic, and a basal polytomy within the subgenus with only one consistent grouping: *P. (U.) harrisoni* plus *P. (U.) praegnans*. The majority rule tree shows that in most trees there are three major groups, *P. (U.) flavum* to *P. (U.) cultellatum*, *P. (U.) kakumense* to *P. (U.) spinibojum*, and *P. (U.) canum* to *P. (U.) pedatum*. The consistency index (CI) is 0.603, the retention index (RI) 0.558, and the rescaled consistency index (RC) 0.337.

Because of the many question marks it is better to perform parsimony analyses excluding species with unknown immatures or at least unknown pupae. The strict consensus and majority rule trees of the 9 trees arrived at when excluding species known only as imagines, using *Phaenopsectra* as outgroup will appear from Fig. 1 B. The trees have 175 steps, a consistency index (CI) of 0.754, retention index (RI) of 0.552, and a rescaled consistency index (RC) of 0.416.

Table 2 (continued).

Tableau 2 (suite).

Trends	13	14	15	16	17	18	19	20	21	22	23	24
<i>acutulum</i>	1	1	1	0	0	1	0	2	2	0	0	0
<i>albicorpum</i>	1	1	1	0	0	2	0	2	2	0&1	1	0
<i>annulatum</i>	0	1	1	0	0	0	1	0	2	0	0	1
<i>aviceps</i>	1	1	3	0	0	1	0	3	2	0	0&1	1
<i>canum</i>	0	1	3	1	0	0	?	?	3	0	0	?
<i>cinctum</i>	0	1	1	0	0	0	0	3	2	0	1	1
<i>convictum</i>	0	1	1	0	0	0&1	0	3	1&2	0	1	1
<i>cultellatum</i>	0&1	1	1	0	0	1	0	0&3	1&2	1	1	0
<i>cumberi</i>	0	1	0	0	0	1	?	?	3	0	0	?
<i>dossenudum</i>	1	1	1	0	0	0&1	0	2	2	0	0	0&1
<i>flavum</i>	0	1	1	0	0	0	0	3	1	0	1	1
<i>freemani</i>	?	1	0	0	0	0	0	2	1	0	1	0
<i>gladysae</i>	0	1	2	0	0	0	0	2	2	0	0	0
<i>harrisi</i>	?	1	0	0	0	1	0	2	3	1	1	0
<i>harrisoni</i>	0	1	3	0	0	2	0	2	3	1	1	0
<i>hiroshimaense</i>	0	1	1&2	0	0	1	0	3	2	0	1	1
<i>kakumense</i>	0	1	2	0	1	0	1	0	2	0	0	1
<i>kibatiense</i>	?	1	1	0	0	1	0	2	2	0	1	0&1
<i>lehmanni</i>	0	1	0	0	0	1	1	0	2	0	0	0
<i>microzoster</i>	0	1	2	0	0	1	0	1	2	0	1	?
<i>oresitrophum</i>	0	1	0	0	0	1	1	0	1	0	0	?
<i>paraviceps</i>	0	1	2	0	0	1	0	3	0&1&2	0	0	?
<i>pedatum</i>	0	1	1	0	1	0	0	1	1&2	0	0	0&1
<i>plautum</i>	0	1	2	0	0	0	1	0	2	0	0	1
<i>praegnans</i>	?	1	3	1	0	2	0	2	3	1	1	1
<i>pseudoconvictum</i>	1	1	1	0	0	0	0	0	2	0	1	1
<i>spinibojum</i>	0	1	0&1	0	0	0&1	1	0	2	0	0	1
<i>sulaceps</i>	0	1	1	0	0	1	0	3	2	0	1	0&1
<i>surugense</i>	0	1	1	0	0	1	0	3	2	0	1	?
<i>tamasemusi</i>	0	1	2	0	0	0	0	0	2	0	0	1
<i>tesfayi</i>	0	1	1	0	0	1	0	3	3	0	1	1
<i>Tripodura</i>	0&1	2	0	0	0	1	0	0	2	0&1	0	0&
<i>Polypedilum</i>	0&1	0	0	0	0	1	0&1	0&1&2	1&2	0	0	0&
<i>Phaenopsectra</i>	0	0	0	0	0	0	0	0	0	0	0	1

However, most of the trends used for the imagines are unlikely to be of significance for anything else than separating closely related species as they concern coloration, size or setal counts. Such trends are much exposed to parallelism and convergence and should accordingly receive less weight. They often are excluded from parsimony searches, but to do that is to defeat the rationale of parsimony. A few of the trends among the imagines, primarily those concerning the superior volsella, and several of the trends among the immatures,

however, are highly significant and unique within the genus or even among chironomids. Such trends obviously should receive higher weight. Accordingly trends 7, 14, 16, 27, 40, 41, 44, and 46 are given a weight of 8; trends 12, 17, 29, 30, 34, and 42 a weight of 5; and trends 2, 18, 19, 21, 22, 31, 32, 35, 36, 37 and 38 a weight of 3; trends 12, 21, 28 and 39 ordered. When all species are included there are 125 trees with a CI of 0.655, a RI of 0.635, and a RC of 0.416. There are five species groups, the *kibatiense*, *oresitrophum*,

Table 2 (continued).

Tableau 2 (suite).

Trends	25	26	27	28	29	30	31	32	33	34	35	36
<i>acutulum</i>	2	0	0	0	1	?	?	?	?	?	?	?
<i>albicorpum</i>	0	0	0	0	?	?	?	?	?	?	?	?
<i>annulatum</i>	2	0	0	0	?	?	?	?	?	?	?	?
<i>aviceps</i>	2	0	1	0&1	?	?	?	2	0	1	0	0
<i>canum</i>	?	0	0	1	?	?	?	?	?	?	?	?
<i>cinctum</i>	1	0	0	0	?	?	?	?	?	?	?	?
<i>convictum</i>	2	1	0	1	?	1	?	0	0	1	0	0
<i>cultellatum</i>	0	0	0	0&1	1	1	1	1	1	0	0	0
<i>cumberi</i>	?	0	0	1	?	?	?	?	?	?	?	?
<i>dossenuzum</i>	1	0	0	1	1	1	0	1	1	1	0	0
<i>flavum</i>	2	0	0	1	?	1	?	2	0	1	0	0
<i>freemani</i>	2	0	0	0	?	?	?	?	?	?	?	?
<i>gladysae</i>	2	0	0	0	?	?	?	?	?	?	?	?
<i>harrisi</i>	2	0	0	1	?	?	?	?	?	?	?	?
<i>harrisoni</i>	2	0	0	1	?	?	?	?	?	?	?	?
<i>hiroshimaense</i>	2	0	0	0	?	?	?	?	?	?	?	?
<i>kakumense</i>	2	0	0	0	?	?	?	?	?	?	?	?
<i>kibatiense</i>	2	0	0	1	?	?	?	?	?	?	?	?
<i>lehmanni</i>	2	0	0	1	?	2	0	1	1	1	1	0
<i>microzoster</i>	2	0	0	1	?	?	?	?	?	?	?	?
<i>oresitrophum</i>	?	1	0	0	?	?	1	1	1	1	1	1
<i>paraviceps</i>	2	0	1	1	2	?	0	1	1	0&1	1	0
<i>pedatum</i>	1	0	0	1	?	?	?	?	?	?	?	?
<i>plautum</i>	2	0	0	0	1	?	0	1	0	1	1	0
<i>praegnans</i>	0	0	0	0	?	?	?	?	?	?	?	?
<i>pseudoconvictum</i>	1	1	0	1	?	?	?	?	?	?	?	?
<i>spinibojum</i>	2	0	0	0	?	?	?	?	?	?	?	?
<i>suliceps</i>	2	0	0	0	?	?	?	?	?	?	?	?
<i>surugense</i>	2	0	1	0	2	?	0	1	1	0&1	1	1
<i>tamasemusi</i>	0	0	0	0	?	?	?	?	?	?	?	?
<i>tesfayi</i>	1	0	0	0	1	2	?	1	1	1	0	
<i>Tripodura</i>	0&1	0	1	0&1	0&1	0&1	?	1	1	0	0	1
<i>Polypedilum</i>	0&1&2	0	1	1	0&1	0&1	0	1	0&1	0&1	0&1	0&1
<i>Phaenopsectra</i>	1	0	0	0	0	1	0	1	1	0	0	1

convictum, *cultellatum* and *pseudoconvictum* groups, *P. (U.) cinctum* and *P. (U.) suliceps* appear separately ; and *P. (U.) tamasemusi* forms the sister group of all the remaining species of the subgenus. Reweighting these trees according to the rescaled consistency index (RC) gives a similar result. However, *P. (U.) harrisoni* and *P. (U.) praegnans* are moved from the *cultellatum* group to the *kibatiense* group (Fig. 2 A). There are 25 trees, the CI is 0.719, the RI 0.706, and the RC 0.507. Eliminating species with unknown immatures results

in 5 trees with a CI of 0.842, a RI of 0.729, a RC of 0.614 and the same groups (Fig. 2 B). All the groups are maintained.

The *kibatiense* group as defined by Fig. 2 A consists of mainly Afrotropical species but includes three species from New Zealand.

The *convictum* group consists of Japanese and Nearctic species with one Palaearctic and Oriental species and one species from Guatemala.

Table 2 (continued).

Tableau 2 (suite).

Trends	37	38	39	40	41	42	43	44	45	46
<i>acutulium</i>	?	?	?	?	?	?	?	?	?	?
<i>albicorpum</i>	?	?	?	?	?	?	?	?	?	?
<i>annulatum</i>	?	?	?	?	?	?	?	?	?	?
<i>aviceps</i>	0	0&1	0	1	0	0	1	0	1	0
<i>canum</i>	?	?	?	?	?	?	?	?	?	?
<i>cinctum</i>	?	?	?	?	?	?	?	?	?	?
<i>convictum</i>	0	?	0&1	1	?	0	0	0	1	0
<i>cultellatum</i>	0	0	1	1	?	1	1	0	1	0
<i>cumberi</i>	?	?	?	?	?	?	?	?	?	?
<i>dossenudum</i>	0	0	1	?	?	?	1	1	0	0
<i>flavum</i>	0	?	0&1	1	0	1	1	0	1	0
<i>freemani</i>	?	?	?	?	?	?	?	?	?	?
<i>gladysae</i>	?	?	?	?	?	?	?	?	?	?
<i>harrisi</i>	?	?	?	?	?	?	?	?	?	?
<i>harrisoni</i>	?	?	?	?	?	?	?	?	?	?
<i>hirosimaense</i>	?	?	?	?	?	?	?	?	?	?
<i>kakumense</i>	?	?	?	?	?	?	?	?	?	?
<i>kibatiense</i>	?	?	?	?	?	?	?	?	?	?
<i>lehmanni</i>	0	?	?	?	?	?	?	?	?	?
<i>microzoster</i>	?	?	?	?	?	?	?	?	?	?
<i>oresitrophum</i>	1	0&1	0	1	?	1	1	1	1	0
<i>paraviceps</i>	0	0	2	1	0	0	1	0	1	0
<i>pedatum</i>	?	?	?	?	?	?	?	?	?	?
<i>plautum</i>	0	?	?	?	?	?	?	?	?	?
<i>praegnans</i>	?	?	?	?	?	?	?	?	?	?
<i>pseudoconvictum</i>	?	?	?	?	?	?	?	?	?	?
<i>spinibojum</i>	?	?	?	?	?	?	?	?	?	?
<i>sulaceps</i>	?	?	?	?	?	?	?	?	?	?
<i>surugense</i>	1	0	1&2	1	0	0	1	0	1	0
<i>tamasebusi</i>	?	?	?	?	?	?	?	?	?	?
<i>tesfayi</i>	0	?	?	?	?	?	?	?	?	?
<i>Tripodura</i>	0	1	0	1	1	1	1	1	0	1
<i>Polypedilum</i>	0&1	1	0	0	0&1	0	0&1	1	0&1	1
<i>Phaenopsectra</i>	0	0	1&2	0	0	1	0	1	0	0

The *cultellatum* group includes one Holarctic species together with one from Micronesia.

The *oresitrophum* group except from the basal *P. (U.) oresitrophum* from Australia consists of Afrotropical species.

The *pseudoconvictum* group includes one species from Peru together with one Nearctic species also present in Japan and one Afrotropical species.

The placement of the basal species as well as of the members of the *cultellatum* and *pseudoconvictum* groups are highly uncertain and tentative.

It would have been advantageous to study the phylogeny inside the subgenus *Uresipedilum* also by Hennigian methods, i. e. by a scheme of argumentation. However, in view of the decisive importance of the immatures and the lack of information of most of these, such an attempt would be as tentative and preliminary as the present argumentation.

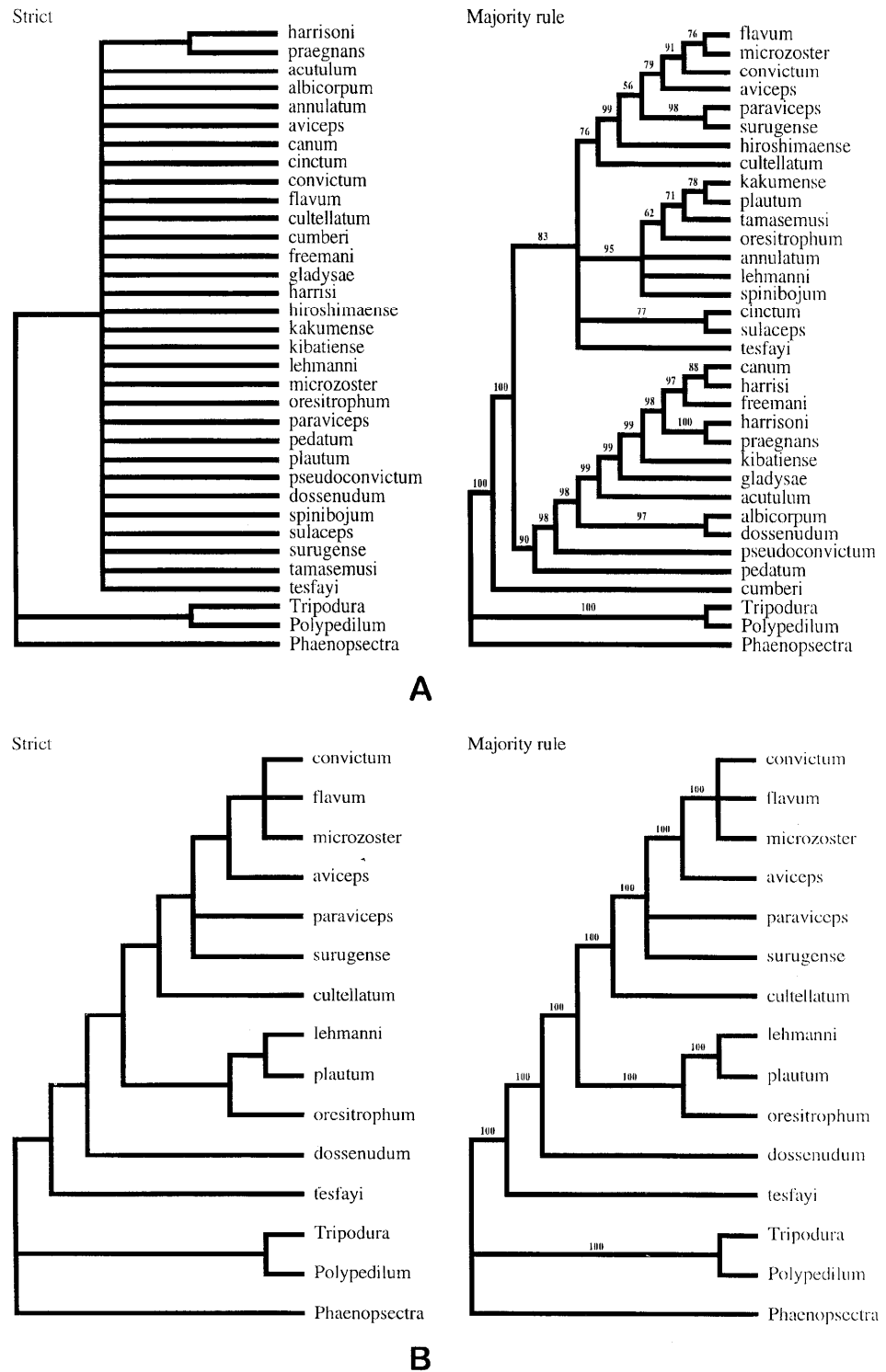
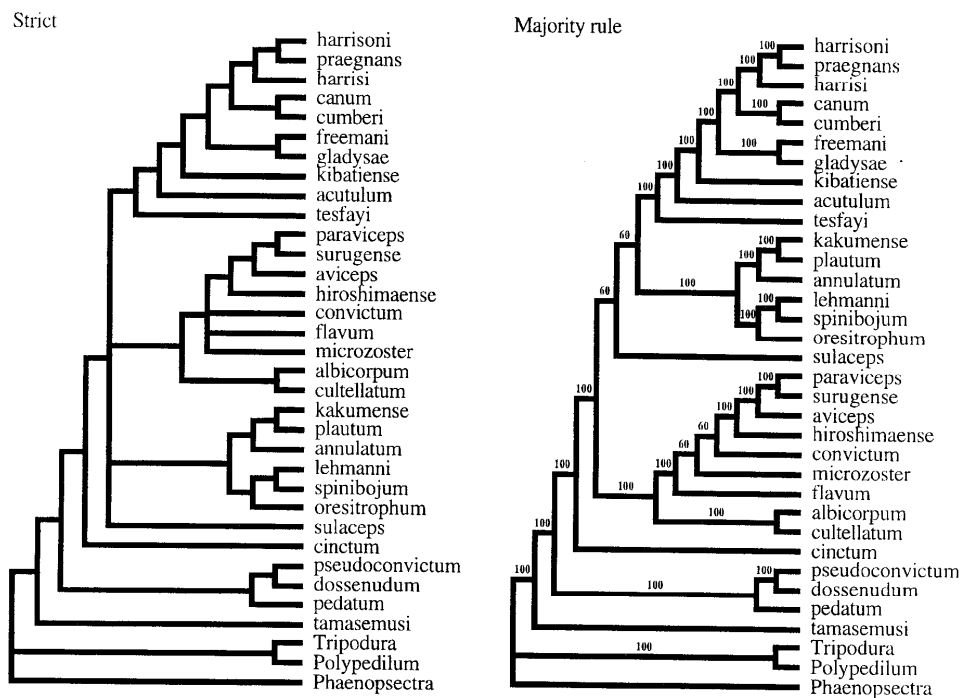
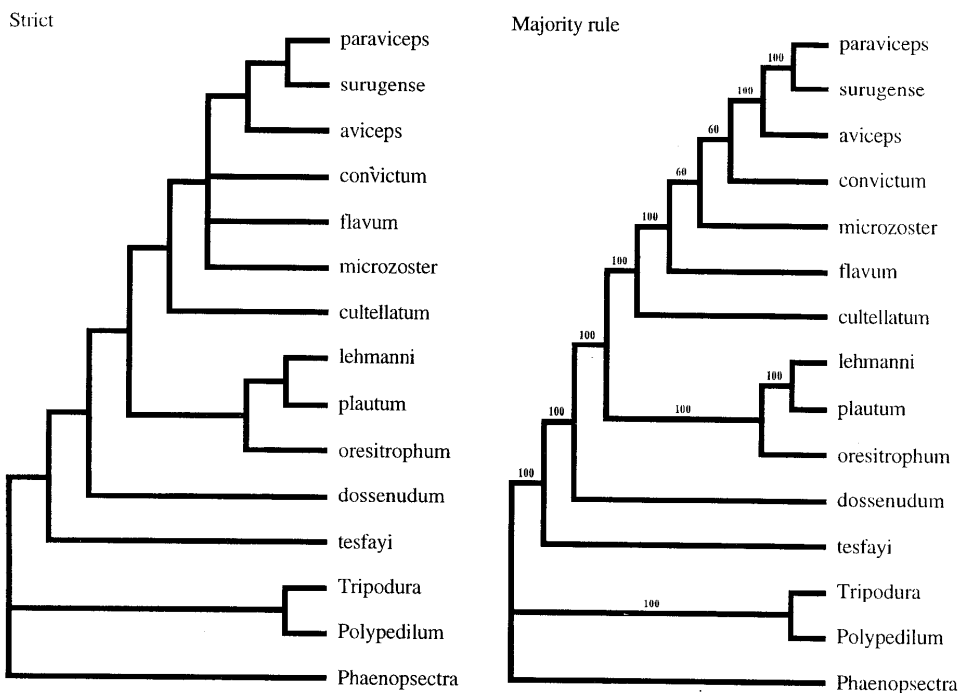


Fig. 1. Parsimony analysis of the relationships within *Polypedilum* subgenus *Uresipedilum* Sasa et Kikuchi : A. Strict consensus and majority rule trees of full data matrix with trends unordered and unweighted ; B. Strict consensus and majority rule trees of species with immatures, least pupae known.

Fig. 1. Analyse de parcimonie des relations phylogénétiques dans le sous-genre *Uresipedilum* Sasa et Kikuchi. A. Arbre consensus strict et arbre obtenu avec l'option «majority rule» à partir de la matrice complète de données (caractères non ordonnés et non pondérés) ; B. Arbre consensus strict et arbres obtenus avec l'option «majority rule» pour les espèces connues aux stades immatures ou au moins nymphal.



A



B

Fig. 2. Parsimony analysis of the relationships within *Polypedilum* subgenus *Uresipedilum* Sasa et Kikuchi : A. Strict consensus and majority rule trees with all species included some trends weighted and the result reweighted according to the rescaled consistency index ; B. The trees obtained when species without known immatures are excluded and some trends weighted.

Fig. 2. Analyse de parcimonie des relations phylogénétiques dans le sous-genre *Uresipedilum* Sasa et Kikuchi. A. Arbre consensus strict et arbres obtenus avec l'option «majority rule» pour toutes les espèces (certains caractères ont été pondérés et les résultats repondérés à l'aide de l'index de cohérence re-étalonné ; B. Arbres obtenus lorsque les espèces sans stade préimaginal connu sont exclues de l'analyse (certains caractères ont été pondérés).

4.3. Key to the male imagines of Afrotropical members of *Polypedilum* subgenus *Uresipedilum* Sasa et Kikuchi

1. Superior volsella without microtrichiae, apex nearly straight ; tergite IX with 12-26 median setae ; R₄₊₅ with 21-50 setae ; scale of front tibia without apical spur, rounded or occasionally pointed 2
 - Superior volsella with at least some microtrichiae, heel often pronounced ; tergite IX with 4-20 median setae ; R₄₊₅ either with 1-29 or with more than 50 setae ; scale of front tibia with apical spine or at least sharply pointed, rounded without spine in *P. (U.) dossenudum* sp. n. only 6
2. Base of superior volsella narrow, apicomedial projection curved 3
 - Base of superior volsella broad, apicomedial projection curved 4
3. Superior volsella with relatively short apicomedial projection and apical setae ; R₄₊₅ with 21-25 setae *P. (U.) kakumense* sp. n.
 - Superior volsella with very long apicomedial projection and apical setae, R₄₊₅ with 38 setae *P. (U.) lehmanni* sp. n.
4. Abdomen distinctly banded ; thorax almost completely dark, antepronotum without spine *P. (U.) annulatum* Freeman.
 - Abdomen not banded, antepronotum with or without a spine 5
5. Antepronotum usually with a spine, thorax dark ; M and RM with 1-5 and 1-2 setae respectively *P. (U.) spinibojum* sp. n.
 - Antepronotum without spine ; thorax with dark vittae and a dark spot ; M and RM bare *P. (U.) plautum* sp. n.
6. Superior volsella without inner setae 7
 - Superior volsella with inner setae 9
7. Abdomen distinctly banded, thorax almost completely dark ; superior volsella with 3-4 apical setae and short apicomedial projection ; tergite IX with 4-12 median setae ; R with 9-18 setae, R₁ with 7-12 setae, R₄₊₅ with 9-20 setae ; scutellum with 4-7 setae 8
 - Abdomen and thorax pale yellow ; superior volsella with 1 apical seta, relatively long apicomedial projection arises subterminally and points inwards ; tergite IX with 20 median setae ; R with 32 setae, R₁ with 23 setae, R₄₊₅ with 52 setae ; scutellum with 26 setae *P. (U.) tesfayi* Harrison
8. Base of superior volsella swollen and broad, apical spur of front tibial scale well developed *P. (U.) praegnans* sp. n.
 - Base of superior volsella narrow, front tibial scale at most with very short apical spine *P. (U.) harrisoni* sp. n.
9. Abdominal segments VI-IX mostly dark ; superior volsella with 2-4, usually 3 inner setae and long apicomedial projection *P. (U.) freemani* sp. n.

- Abdomen either with all segments yellow to pale yellow with or without dark apices or distinctly banded ; thorax either completely dark or pale, but with vittae not dark or scutellum dark ; superior volsella with 1-3, usually 2 inner setae and long or short apicomedial projection 10
- 10. Abdomen pale yellow or at most with segment apices dark, thorax almost completely dark or with various dark patches ; superior volsella with long to moderately long apicomedial projection 11
 - Abdomen yellow without dark apices, thorax with 3 dark spots ; superior volsella with short apicomedial projection 12
- 11. Superior volsella with strong projecting bulbous heel, inner setae of superior volsella placed on apicomedial projection ; thorax dark at antepronotum, postnotum and scutellum ; scale of front tibia with apical spine *P. (U.) kibatiense* Goetghebuer
 - Superior volsella with nearly flat to strongly projecting bulbous heel, inner setae distinctly basal of apicomedial projection which appear as separated or attached subterminally to the base ; thorax dark at postnotum and antepronotum or almost completely dark ; scale of front tibia rounded *P. (U.) dossenudum* sp. n.
- 12. Superior volsella with relatively short apical seta, AR about 0.74, LR₁ about 2.60, M with about 2 setae *P. (U.) acutulium* sp. n.
 - Superior volsella with relatively long apical seta, AR 1.21-1.28, LR₁ 1.84-1.87, M bare... *P. (U.) gladysae* sp. n.

4. 4. Description of species

The species described fully below are the known Afrotropical species belonging to the subgenus *Uresipedilum*. In addition the Palaearctic species *P. (U.) convictum*, here designated as type species of the subgenus, is described for comparison, and *P. (Polypedilum) ephippium* and *P. (Polypedilum) anderseni* sp. n. described since they together with *P. (U.) freemani* sp. n. are part of the same type series of *P. (P.) ephippium*.

4.4.1. *pseudoconvictum* group

Imagines moderately large, wing length less than 2.0 mm ; thorax almost totally dark, legs unicoloured ; fore tibial scale rounded ; superior volsella [Fig. 5 H, J-N ; Townes 1945 fig. 54 ; Maschwitz 1975 fig. 54 for *P. (U.) pedatum* ; Bidawid-Kafka 1996 fig. 15 for *P. (U.) pseudoconvictum*] with nearly straight apex or with pronounced heel, base either covered with microtrichiae, with microtrichiae present at base only, or both at base and apex, but with microtrichiae free areas, with 2-3 inner setae and 1 apical seta ; anal tergite bands weak, not fused basal to median setae.

Known pupa with cephalic tubercles reduced to low humps, frontal setae short, prealar tubercle absent,

conjunctive III/IV without spinules, pedes spurii A present.

Known larva with barely indicated or absent posterior lobes, distance between plates at most about as long as combined width of 4 median teeth.

Included species : *P. (U.) pseudoconvictum*, *P. (U.) dossenudum*, and *P. (U.) pedatum*.

This group is rather uncertain and tentative.

***Polypedilum (Uresipedilum) dossenudum* sp. n.**

(Figs. 3 B, 4 E, 5, 6)

Type locality. - GHANA : Eastern Region, Boti Falls.

Type material. - Holotype ♂, reared from larva, here designated, GHANA : Eastern Region, Boti Falls, 14. X. 1994, NUFU project (ZMBN Type No. 274). Paratypes : UGANDA : L. Victoria, 1 ♂, 1950-52, W. W. Macdonald (BMNH, B. M. 1953-560) ; ETHIOPIA : Bahar, Lake Dar am Tana, 1 ♂, 26. I. 1977, J. Reichholt (ZSM). ZAÏRE : Lualaba, 1 ♂, 25. I. 1939, H. J. Bredo (BMNH, Belg. I. G. 12.290) ; GHANA : Eastern Region, Subri River, 1 ♂, 4. II. 1993, Light trap, NUFU project (ZMBN, No. 66) ; Greater Accra Region, Legon Botanical garden, Vaughan pond, 1 ♂, 2. XI. 1994, NUFU project (ZMBN, No. 161) ; Western Region, Ankasa Game Production Reserve, 3 ♂, 6-12. XII. 1993, Malaise trap Nos. 1&12, NUFU project (ZMBN, Nos. 84, 86, 983) ; CONGO : Brazzaville, 5 ♂, 3. V. 1957, J. Hamon, (BMNH, A. E. F).

Diagnostic characters. - Differs from other members of the subgenus in having apicomedial projection appearing as separated or attached subterminally to base ; and the tip of the apicomedial projection curved up. It is the only species having the apices of the abdominal segments dark.

Etymology. - From Latin, *dossenus*, jester, clown, and, *udo*, shoe, sock, referring to the shape of the superior volsella.

Male imago

(n= 9-10, except when otherwise stated).

Total length 2.41- 3.52, 2.72 mm. Wing length 1.28-1.69, 1.43 mm. Total length/ wing length 1.77-2.26, 1.93. Wing length/ length of profemur 1.14-2.04, 1.84.

Coloration. Thorax yellowish brown at postnotum and anteprepronotum (Fig. 3 B) or almost completely brown as in Fig. 3 A. Abdomen pale yellow with dark apices of segments (Fig. 4 E). Femur, tibia and tarsi yellow.

Head (Fig. 5 A). AR 1.40-1.80, 1.60. Ultimate flagellomere 547-710, 603 µm long. Temporal setae 7-15, 10 ; including 3-5, 4 inner verticals ; 2-7, 4 outer verticals ; and 1-4, 2 postorbitals. Clypeus with 13-21, 18 setae. Tentorium 98-167, 129 µm long ; 26-34, 29 µm wide at sieve pore ; 2-9, 6 µm wide at posterior tentorial pit. Stipes 120-168, 147 µm long. Palpomere lengths (in µm) : 22-47, 31 ; 29-53, 40 ; 42-120, 85 ; 87-123, 100 ; 95-200, 157. Fifth / third palpomere 1.44-2.26, 1.90 (8). Third palpomere with 2 sensilla clavata.

Thorax (Fig. 5 B). Acrostichals 14-20, 17 ; dorso-centrals 12-18, 14 ; prealars 4-6, 5. Scutellum with 7-10, 8 setae.

Wing (Fig. 5 C). VR 1.11-1.24, 1.17. Brachiolum with 1 seta ; R with 15-24, 18 ; R₁ with 10-16, 12 ; R₄₊₅ with 14-30, 18 setae ; M bare. Squama with 6-11, 9 setae.

Legs. Scale on front tibia (Fig. 5 D) 20-44, 27 (6) µm long, rounded. Spurs on middle tibia (Fig. 5 E) 55-109, 74 µm long ; on hind tibia (Fig. 5 F) 47-80, 60 µm long. Comb on middle tibia 11-22, 18 µm long ; long and short comb on hind tibia 22-31, 27 µm and 13-29, 22 µm long respectively. Width at apex of front tibia 42-53, 46 µm ; of middle tibia 42-48, 45 µm ; of hind tibia 40-60, 50 µm. Lengths (in mm) and proportions of legs :

	fe	ti	ta ₁	ta ₂
p ₁	649-840, 753	331-506, 418	776-947, 886 (6)	534-735, 624 (6)
p ₂	694-894, 775	520-687, 606	285-381, 328	192-231, 20
p ₃	708-947, 812	530-822, 692	402-587, 486	139-320, 267
	ta ₃	ta ₄	ta ₅	LR
p ₁	384-443, 409 (6)	274-320, 304 (6)	103-142, 122 (6)	2.10-2.34, 2.23 (6)
p ₂	128-167, 142	71-117, 88	32-46, 37	0.50-0.58, 0.54
p ₃	199-295, 239	117-196, 148	43-75, 59	0.66-0.76, 0.71
	BV	SV	BR	
p ₁	1.29-1.45, 1.40 (6)	1.25-1.34, 1.29 (6)	1.0-2.9, 2.3 (6)	
p ₂	3.26-3.91, 3.56	3.94-4.67, 4.26	2.2-11.8, 5.3 (7)	
p ₃	2.58-3.26, 2.80	3.01-3.21, 3.10	2.9-7.6, 5.0 (8)	

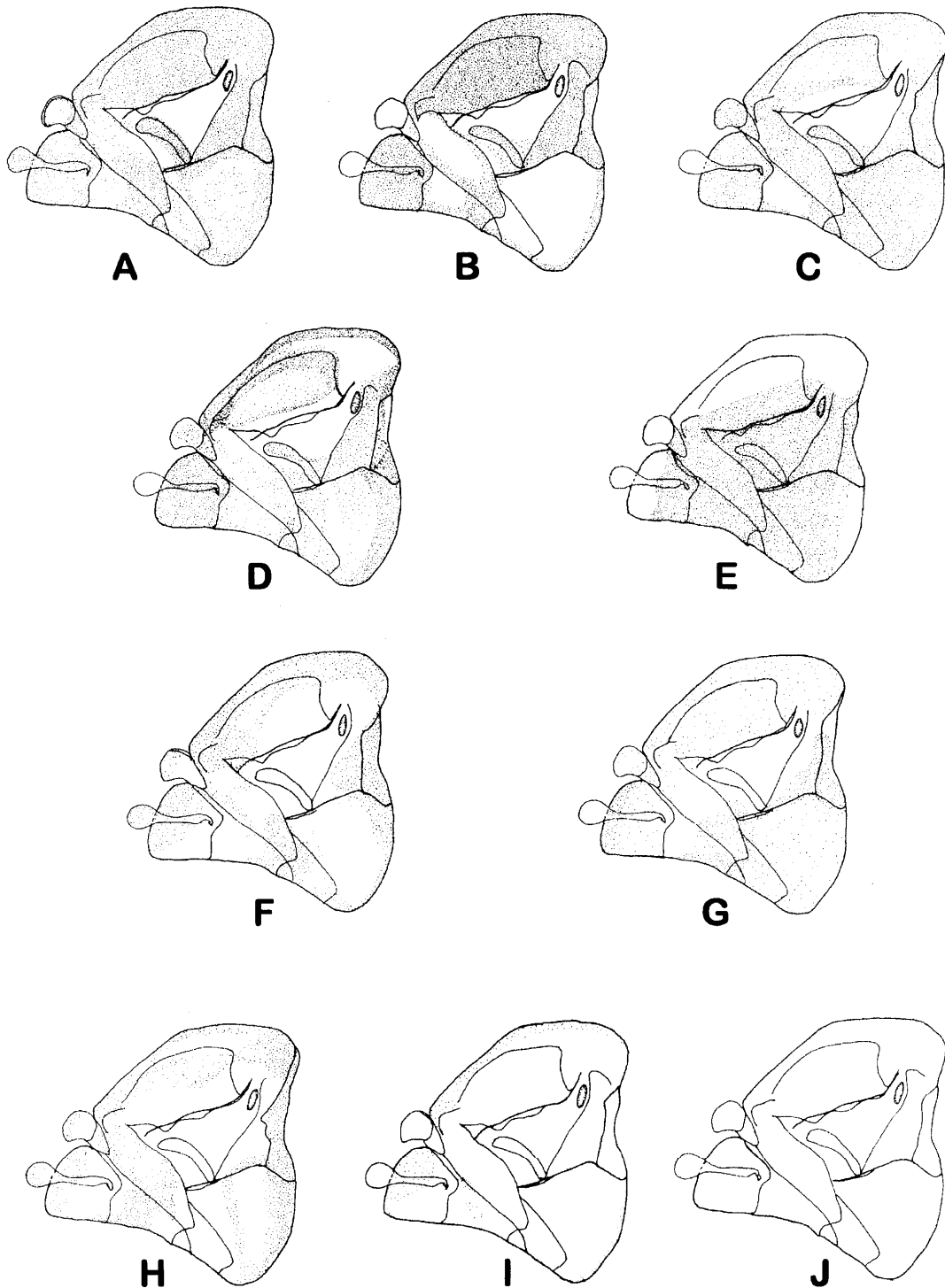


Fig. 3. *Polypedilum* Kieffer, male imago, coloration patterns of thorax : A. *P. (Uresipedilum) annulatum* Freeman, *P. (U.) praegnans* sp. n., *P. (U.) dossenudum* sp. n., *P. (s. str.) ephippium* Freeman ; B. *P. (U.) dossenudum* sp. n. ; C. *P. (U.) freemani* sp. n. ; D. *P. (U.) harrisoni* sp. n. ; E. *P. (U.) spinibojum* sp. n. ; F. *P. (s. str.) anderseni* sp. n. ; G. *P. (U.) acutululum* sp. n., *P. (U.) gladysae* sp. n. ; H. *P. (U.) kibatiense* Goetghebuer ; I. *P. (U.) plautum* sp. n. ; J. *P. convictum* (Walker), *P. (U.) lehmanni* sp. n., *P. (U.) kakumense* sp. n.

Fig. 3. Types de coloration du thorax des espèces du genre *Polypedilum* Kieffer.

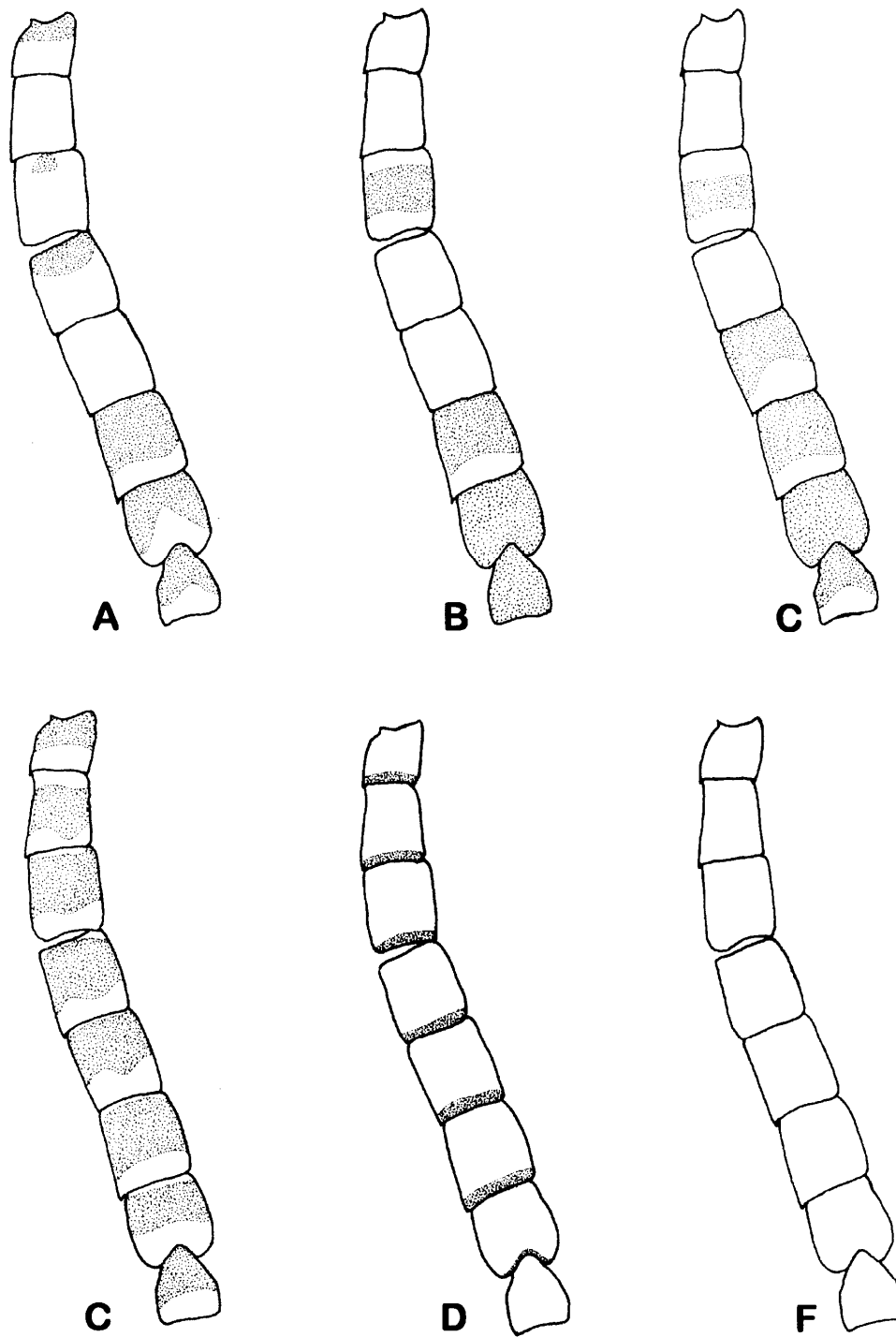


Fig. 4. *Polypedilum* Kieffer, male imago, coloration patterns of abdomen ; A. *P. (s. str.) anderseni* sp. n. ; B. *P. (s. str.) ephippium* Freeman. ; C. *P. (Uresipedilum) freemani* sp. n. ; D. *P. (U.) annulatum* Freeman, *P. (U.) harrisoni* sp. n., *P. (U.) praegnans* sp. n. ; E. *P. (U.) dossenudum* sp. n. ; F. *P. (U.) convictum*, *P. (U.) spinibojum* sp. n., *P. (U.) plautum* sp. n., *P. (U.) lehmanni* sp. n., *P. (U.) acutulum* sp. n., *P. (U.) gladysae* sp. n., *P. (U.) kakumense* sp. n.

Fig. 4. Types de coloration de l'abdomen des espèces du genre *Polypedilum* Kieffer.

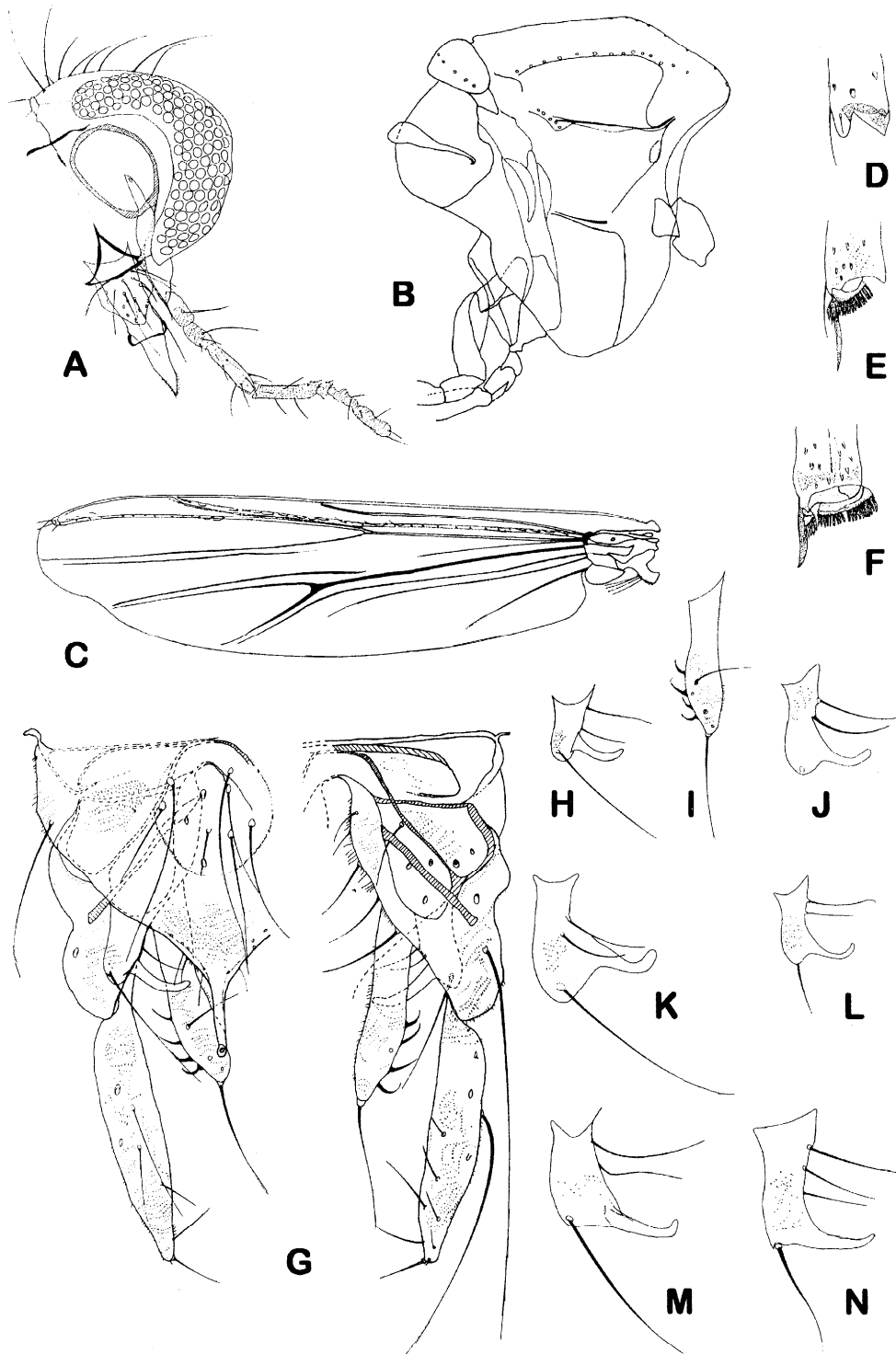


Fig. 5. *P. (U.) dossevadum* sp. n., male imago ; A. Head ; B. Thorax ; C. Wing ; D. Fore tibia ; E. Mid tibia ; F. Hind tibia ; G. Hypopygium ; H. Superior volsella ; I. Inferior volsella ; J-N. Superior volsellae, variation.

Fig. 5. Imago mâle de *P. (U.) dossevadum* n. sp. A. Tête ; B. Thorax ; C. Aile ; D. Tibia antérieur ; E. Tibia moyen ; F. Tibia postérieur ; G. Hypopyge ; H. Volsella supérieure ; I. Volsella inférieure ; J-N. Variations de la Volsella supérieure.

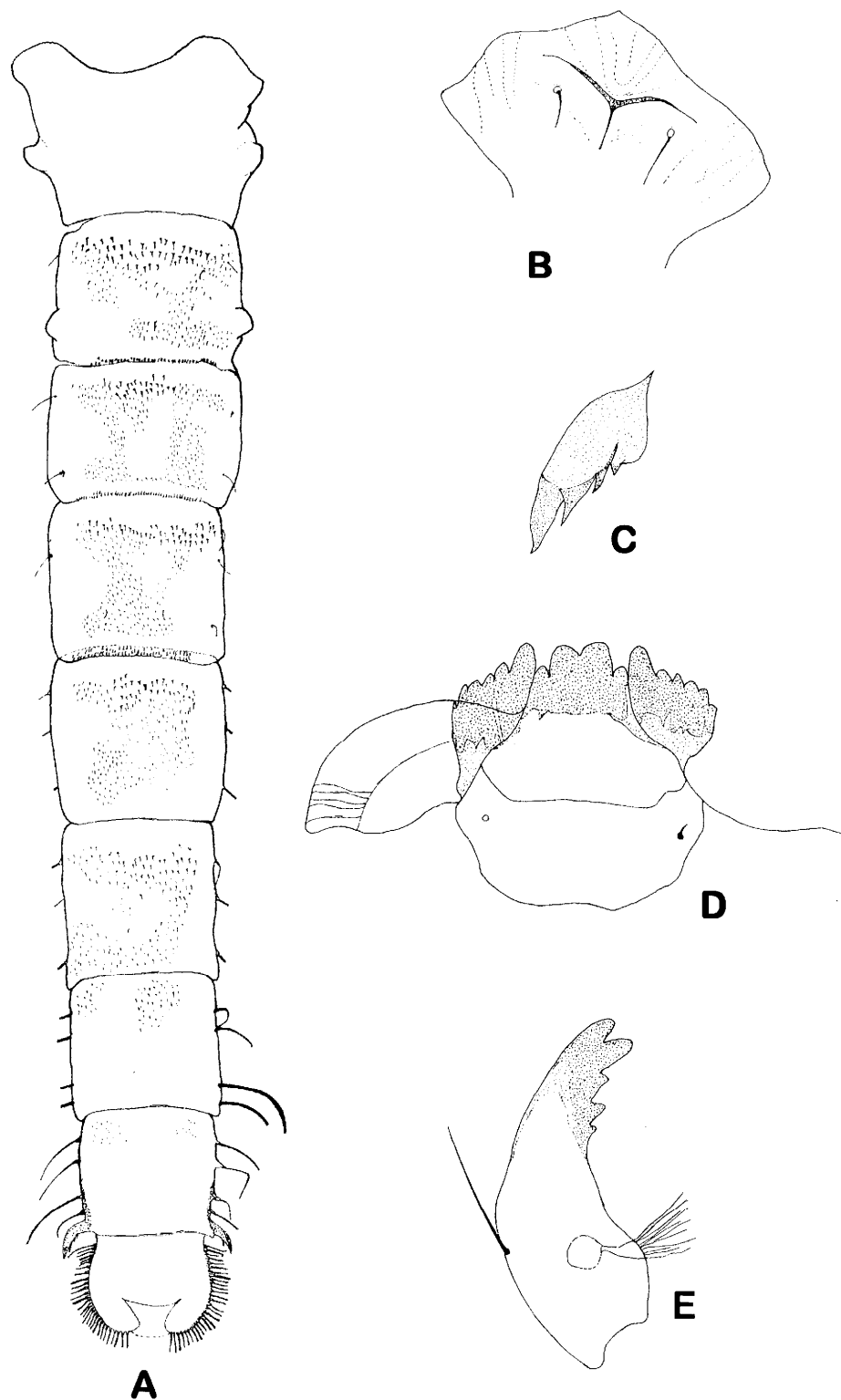


Fig. 6. *P. (U.) dossenudum* sp. n., immatures : A-C. Pupa ; A. Abdomen ; B. Cephalic area ; C. Anal spur ; D-E. Larva ; D. Mentum ; Mandible.
 Fig. 6. *P. (U.) dossenudum* n. sp. stades immatures. A-C. Nymphe ; A. Abdomen ; B. Région céphalique ; C. Eperon anal ; D-E. Larve ; D. Mentum ; E. Mandibule.

Hypopygium (Fig. 5 G-N). Tergite IX with 8-18, 12 median setae ; and altogether 10-18, 15 posterior setae to each side of anal point. Laterosternite IX with 2-5, 3 setae. Anal point 53-90, 73 μm long ; 34-69, 52 μm wide at base, gradually tapering to nearly parallel-sided towards 2-7 μm wide apex. Transverse sternapodeme 16-44, 25 μm long ; phallapodeme 56-104, 80 μm long. Gonocoxite 122-169 μm long. Total length of superior volsella including apicomedial projection 58-78, 66 μm ; apicomedial projection 24-36, 32 μm long ; base with 2-3 inner and 1 apical setae, microtrichiae present on dorsal surface. Inferior volsella 102-122, 112 μm long, parallel sided and with prominent apical seta. Gonostylus 142-189, 149 μm long. HR 0.86-1.12, 0.95 ; HV 1.63-2.16, 1.86.

Pupa

(n= 1)

Total length about 3.8 mm. Exuviae with brown cephalothorax with margins of wing sheath golden brown, and mesal paratergital margins of segments VI-VIII and caudolateral spur brown.

Cephalothorax. Cephalic tubercles barely indicated. Frontal setae 56 μm long (Fig. 6 B). Prealar tubercle apparently absent.

Abdomen (Fig. 6 A). Tergite I bare ; tergites II-VI each with strong anterior band of spinules and strong median and posterior shagreen ; tergites VII and VIII each with two anteriomedian spots of shagreen ; tergite IX bare. Sternites bare. Tergite II with 46 caudal hooklets. Conjunctive III/IV with 46 uniserial, mostly anteriorly directed, hook-like spines ; conjunctive IV/V with 63 uni-biserial similar spines. Pedes spurii A well developed on segment IV. Pedes spurii B well developed on I and II. Anal spur (Fig. 6 C) with strong apical tooth, 1 strong lateral tooth, and 1-3 minute lateral teeth.

Abdominal setation : Segment I without L setae ; II-IV with 3 L setae, none taeniate ; V and VI each with 3 taeniate L setae ; VII and VIII each with 4 taeniate L setae. Fringe of anal lobe with 29 taeniae, no dorsal seta.

Larva

(n= 1)

Total length about 4.7 mm. Head capsule 0.99 mm long. Postmentum 188 μm long. Head capsule yellowish brown with postoccipital margin, teeth of mentum and mandible brownish black.

Head. Basal antennal segments 62 μm long, second segment 21 μm long, remaining segments lost. Basal antennal segment 15 μm wide, ring organ 9 μm from base, mark of seta 45 μm from base. Pecten epipharynx

consisting of 3 platelets, each with 3 subequal teeth. Premandible 81 μm long. Mandible (Fig. 6 E) 126 μm long with apical tooth, 3 inner teeth, and dorsal tooth ; seta submentalis well developed ; seta interna with about 10 branches. Mentum (Fig. 6 D) 95 μm wide, with 8 pairs of mental teeth. Four median teeth, 2 inner median teeth each 11.5 μm wide and 2 outer median teeth (otherwise referred to as first lateral teeth), much lower and smaller than inner median and first pair of lateral teeth (second pair of lateral teeth) ; 6 pairs of lateral teeth, with a much lower second and minute sixth. Ventromental plate 83 μm wide, 41 μm high, distance between plate 49 μm ; with 26 striae ; median apices of plates upturned joining outer margins of median teeth.

Abdomen. Procercus 7 μm high, 7 μm wide ; with about 10 anal setae, 539 μm long. Supraanal seta 387 μm long, 0.72 times as long as anal setae. Posterior parapods each with 14 claws. Anal tubules about 143 μm long.

Remarks. - The species shows a large individual variation in the shape of the superior volsella. The specimen from Ethiopia shows an even stronger projecting outer heel than that indicated in Fig. 5 K and could conceivably belong to a separate species.

Ecology and distribution. - The species is known from smaller rivers and ponds in southern Ghana. It is also known from Uganda, Zaire and Congo.

4.4.2. *cultellatum* group

Imagines mostly moderately large with wing lengths less than 2.0 mm ; abdomen and legs uniformly coloured, fore tibial scale rounded or triangular without apical spine ; superior volsellae [Sublette 1960 fig. 1 e (as *P. (P.) subcultellatum* Sublette), Maschwitz 1975 fig. 56, Pinder 1978 fig. 168 C, Albu 1980 fig. 143, Rossaro 1985 fig. 10 H, Sasa & Kikuchi 1995 plate. 32 B, C for *P. (U.) cultellatum* ; Tokunaga 1964 fig. 15 d for *P. (U.) albicorpum*] either covered with microtrichiae or microtrichiae restricted to base or apex, with 3-4 inner setae and 2 or more apical setae ; less than 10 median setae on tergite IX, anal tergite bands apparently absent.

Known pupa with cephalic tubercles reduced to low humps with short frontal setae, prealar tubercle present, conjunctive III/IV with spinules.

Known larva with antennal blade longer than flagellum, ventromental plates with well developed posterior lobes, and distance between ventromental plates at least as long as combined width of 6 median teeth.

Included species : *P. (U.) cultellatum* and *P. (U.) albicorpum*.

4.4.3. *convictum* group

Imagines mostly moderately large with wing lengths less than 2.0 mm; abdomen mostly uniformly coloured, occasionally banded; legs with some markings, fore tibial scale rounded without spur; scutellum with 12 or more setae; anal tergite bands fused basal to median setae, more than 10 median setae; superior volsella [Fig. 7 A, B; Lehmann 1971 fig. 37, Pinder 1978 fig. 66 F, Rossaro 1985 fig. 11, Niitsuma 1992 fig. 7, and Sasa & Kikuchi 1995 plate 32 A for *P. (U.) convictum*; Maschwitz 1975, fig. 53 and Niitsuma 1992, fig. 9 for *P. (U.) aviceps*; Niitsuma 1992 fig. 11 for *P. (U.) surugense*; Niitsuma 1992 fig. 18 for *P. (U.) paraviceps*; Townes 1945 fig. 62 and Maschwitz 1975 figs 48-50 for *P. (U.) flavum* as *P. convictum* and *P. obtusum* Townes; Sasa & Kikuchi 1995 plate 32 D for *P. (U.) hirosimaense*; and Sublette & Sasa 1994 fig. 150, 152 for *P. (U.) microzoster*] with apex nearly straight or rounded, mostly with 2-4 inner setae and one apical seta only, microtrichiae at apex only or occasionally both basally and apically, but with microtrichia-free areas; tergite IX with more than 9 setae, anal tergite bands fused basal to setae, anal point often conspicuously broadened.

Pupae without cephalic tubercles, frontal setae short, prealar tubercles absent, and conjunctive III/IV without spinules.

Larvae with well developed ventromental posterior lobes, antennal blades usually shorter than the flagellum, and distance between ventromental plates at least about as long as width of the 6 median mental teeth.

Included species: *P. (U.) flavum*, *P. (U.) microzoster*, *P. (U.) convictum*, *P. (U.) hirosimaense*, *P. (U.) aviceps*, *P. (U.) surugense*, and *P. (U.) paraviceps*.

From the drawings and descriptions of the larva there appears to be three species described as *P. (U.) convictum* known from Europe (Pinder & Reiss 1983), Russia (Chernovskii 1949, Pankratova 1983) and USA (Maschwitz 1975). However, two adults could be associated, of which one (from USA) is believed to be *P. (U.) flavum* (Johannsen) according to Epler (1995). The species described by Lehmann (1981) as *P. (P.) convictum* is likely to be *P. (U.) plautum* sp. n. described below. The European *P. convictum* is redescribed below for comparison.

Polypedilum (Uresipedilum) convictum (Walker)

(Fig. 7 A, B)

Chironomus convictus Walker, 1856: 161.

Chironomus blandus van der Wulp, 1858: 164.

Polypedilum nympha Kieffer, in Thienemann & Kieffer 1916: 523.

Polypedilum nympha var. *ploenensis* Kieffer, 1922: 359.

Polypedilum convictum (Walker), Goetghebuer 1928: 92; Pinder 1978: fig. 168 B; Rossaro 1985: 22, fig. 10.

? *Chironomus testaceum* Macquart, 1826: 142.

nec *Polypedilum convictum*, Chernovskii, 1949: 153; Pankratova 1983: 247, figs 1-4.

nec *Polypedilum convictum*, Maschwitz 1975: 181 [= *P. flavum* (Johannsen 1905: 225)].

nec *Polypedilum convictum*, Lehmann 1981: 71 [= *P. (U.) plautum* sp. n.].

nec *Polypedilum convictum*, Boesel 1985: 254 [= *P. flavum* (Johannsen 1905: 225) including *P. obtusum* Townes, 1945: 60].

Material examined. - GERMANY: South Bonn, Siebengebirge Nature Protection Reserve, Mucher Wiesenbach, 6 ♂, May 1990, S. Stern.

Male imago (n= 6, except when otherwise stated).

Total length 3.75-3.94, 3.83 mm. Wing length 2.21-2.42, 2.29 mm. Total length/ wing length 1.63-1.71, 1.67. Wing length/ length of profemur 2.38-2.75, 2.55.

Coloration pale yellow to yellow, pattern as in Figs 3 J, 4 F.

Head. AR 1.78-1.93, 1.83. Ultimate flagellomere 733-843, 795 µm long. Temporal setae 8-14, 11 (5) including 3-5, 4 (5) inner verticals, 3-5; 4 (5) outer verticals; and 2-6, 4 (5) postorbitals. Clypeus with 15-21, 18 (5) setae. Tentorium 109-133, 124 µm long; 22-33, 29 µm wide at sieve pore and 3-9, 6 (3) µm wide at posterior tentorial pit. Stipes 153-185, 166 µm long. Palpomere lengths (in µm): 20-49, 37; 36-56, 48; 107-171, 145; 98-153, 127; 139-246, 192 (5). Fifth / third palpomere 1.88-1.46, 1.34 (5).

Thorax. Acrostichals 16-22, 19; dorsocentrals 15-18, 17; prealars 4-5, 5. Scutellum with 9-11, 10 setae.

Wing. VR 1.19-1.23. Brachiolum with 1 seta; R with 23-29, 26; R₁ with 17-21, 19; R₄₊₅ with 35-48, 42 setae. Squama with 9-14, 11 setae.

Legs. Scale on front tibia 29-32, 31 µm long. Spurs on middle tibia 44-56, 50 µm long; on hind tibia 49-63, 56 µm long. Comb on middle tibia 20-30, 24 µm long; long and short comb on hind tibia 20-31, 25 µm and 18-27, 22 µm long respectively. Width at apex of front tibia 49-62, 56 µm; of middle tibia 49-62, 57 µm; of hind tibia 60-80, 69 µm. Lengths (in mm) and proportions of legs:

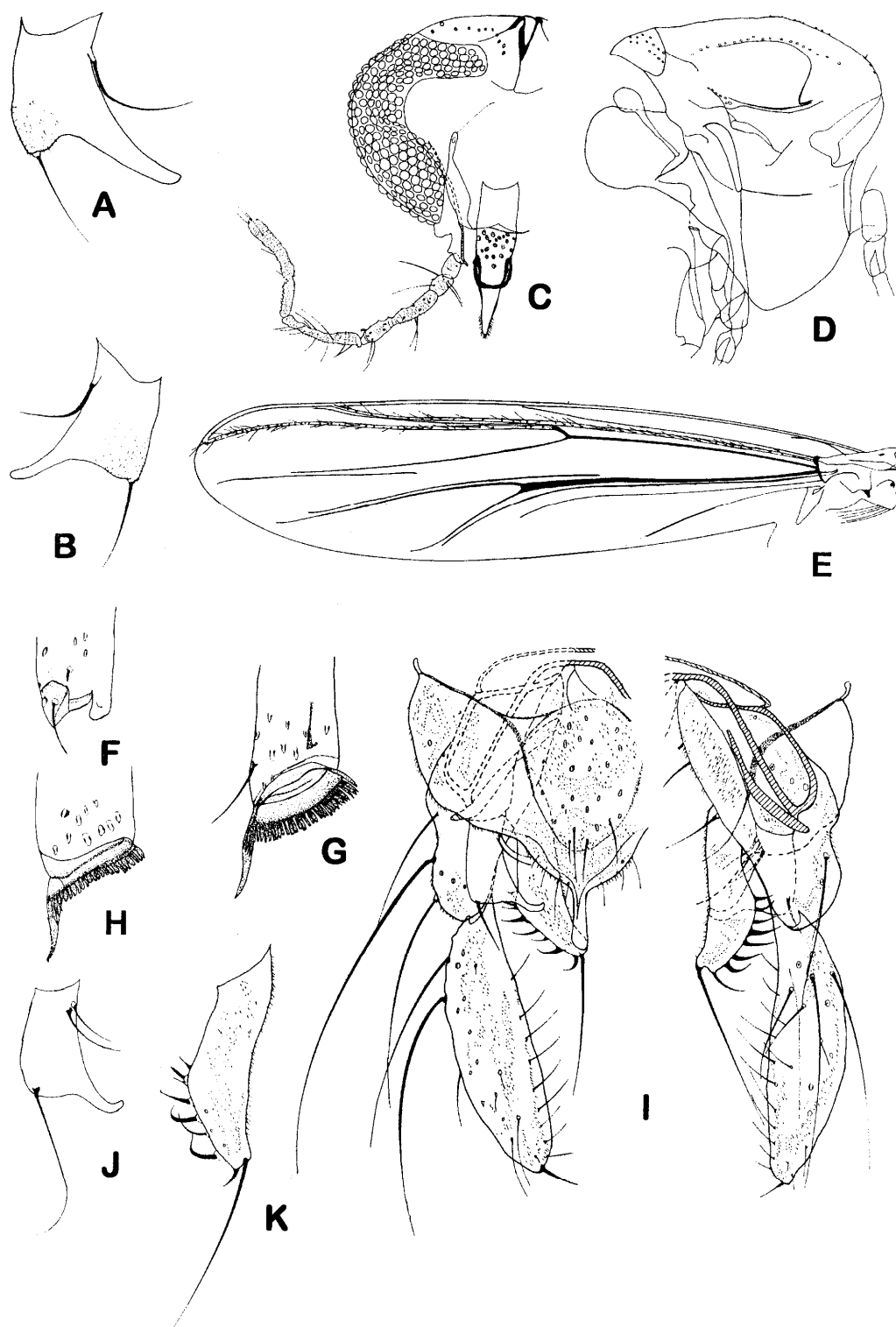


Fig. 7. *P. (Uresipedilum)* spp., male imago : A, B. *P. (U.) convictum* (Walker), superior volsellae. C-K. *P. (U.) annulatum* Freeman : C. Head ; D. Thorax, E. Wing ; F. Fore tibia ; G. Mid tibia ; H. Hind tibia ; I. Hypopygium ; J. Superior volsella ; K. Inferior volsella.

Fig. 7. *P. (U.) dosse nudum* spp., imago mâle. A, B. *P. (U.) convictum* (Walker), volsellae supérieures. C-K. *P. (U.) annulatum* Freeman. C. Tête ; D. Thorax ; E. Tibia antérieure ; G. Tibia moyen ; H. Tibia postérieure ; I. Hypopyge ; J. Volsella supérieure ; K. Volsella inférieure.

	fe	ti	ta ₁	ta ₂
P ₁	819-965, 910	673-748, 705	968-1082, 952 (4)	742-783, 760 (4)
P ₂	933-1070, 1010	854-943, 887	463-506, 482	258-303, 279
P ₃	1029-1150, 1068	961-1068, 1015	687-748, 715	356-388, 377
	ta ₃	ta ₄	ta ₅	LR
P ₁	463-552, 517 (4)	345-424, 392 (4)	153-164, 158 (4)	1.42-1.47, 1.44 (4)
P ₂	195-224, 209	110-123, 121	59-68, 65	0.54-0.56, 0.54
P ₃	310-342, 327	178-192, 183	75-93, 82	0.68-0.73, 0.70
	BV	SV	BR	
P ₁	1.44-1.51, 1.48 (4)	1.57-1.62, 1.60 (4)	2.1-2.3, 2.2 (4)	
P ₂	3.35-3.63, 3.53	3.85-4.00, 3.93	3.5-5.5, 4.4	
P ₃	2.77-2.99, 2.91	2.82-3.96, 2.94	4.8-6.2, 5.4	

Hypopygium. Tergite IX with 11-19, 16 median setae; altogether 14-20, 17 posterior setae to each side of anal point. Laterosternite IX with 3-5, 4 setae. Anal point 54-87, 70 µm long; 7-18, 11 µm wide at base, gradually tapering to nearly parallel-sided towards 6-9, 7 µm wide apex. Transverse sternapodeme 89-127, 109 µm long; phallapodeme 36-56, 46 µm long. Gonocoxite 178-211, 192 µm long. Total length of superior volsella including apicomedial projection 67-78, 73 µm; apicomedial projection 33-43, 39 µm long; base with 1 inner and 1 apical seta, microtrichia present (Fig. 7 A, B). Inferior volsella 129-144, 134 µm long; subapically swollen and with prominent apical seta. Gonostylus 169-189, 179 µm long. HR 1.00-1.19, 1.06; HV 1.88-2.25, 2.08.

Distribution. - Widespread in the Palaearctic region, Oriental China.

4.4.4. *oresitrophum* group

The group consists of moderate to relatively large species with wing lengths often more than 2.0 mm; legs unmarked except in *P. (U.) oresitrophum*; scale at apex of anterior tibia rounded or occasionally pointed, without apical spine; abdomen unicoloured or occasionally banded; superior volsella [Figs 7 J; 10 H, I; 11 H, K-M; and 8 B; Freeman 1960 fig. 24 c for *P. (U.) oresitrophum*] always bare, at most with microtrichia at apex only, base with 2-3 inner and 1 apical setae; anal tergite bands fused basal to median setae.

Cephalic tubercles of known pupae reduced to low humps, frontal setae short, prealar tubercle present or absent, pedes spurii A absent.

Known larvae with antennal blade longer than flagellum, ventromental plates with barely indicated posterior lobes, distance between plates at least as long as combined width of 6 median teeth.

Included species: *P. (U.) oresitrophum*, *P. (U.) spinibojum*, *P. (U.) lehmanni*, *P. (U.) annulatum*, *P. (U.) plautum*, and *P. (U.) kakumense*.

Polypedilum (Uresipedilum) lehmanni sp. n.

(Fig. 8 A-C)

P. (P.) kibatiense Lehmann 1979: 57 pro parte nec *P. (P.) kibatiense* Goetghebuer 1936: 487

Type locality. - ZAIRE: Kalengo.

Type material. - Holotype ♂, reared from larva, here designated, ZAIRE: Kalengo, 2. XI. 1972, J. Lehmann (ZSM, No. E1/ 1980).

Diagnostic characters. - Differs from other members of the subgenus in having a longer, straight apicomedial projection and a slender parallel-sided inferior volsella.

Etymology. - Named after Dr. Jens Lehmann, who first described this species as *P. (U.) kibatiense*.

Male imago

(n= 1).

Total length not measurable (Abdomen and thorax incomplete). Wing length 2.07 mm. Wing length/ length of profemur 2.00.

Coloration. Thorax pale yellow, abdomen yellow, coloration patterns as in Figs. 3 J and 4 F. Femur, tibia and tarsi yellow.

Head. AR 1.56. Ultimate flagellomere 728 µm long. Temporal setae 7 including 2 inner verticals, 3 outer verticals, and 2 postorbitals. Clypeus with 18 setae. Tentorium 18 µm long, 9 µm wide at sieve pore and 6 µm wide at posterior tentorial pit. Stipes 189 µm long. Palpomere lengths (in µm): 36, 44, 167, 147, 248. Fifth / third palpomere 1.49.

Thorax. Acrostichals 20, dorsocentrals 15, prealars 6. Scutellum not measurable (part of thorax torn).

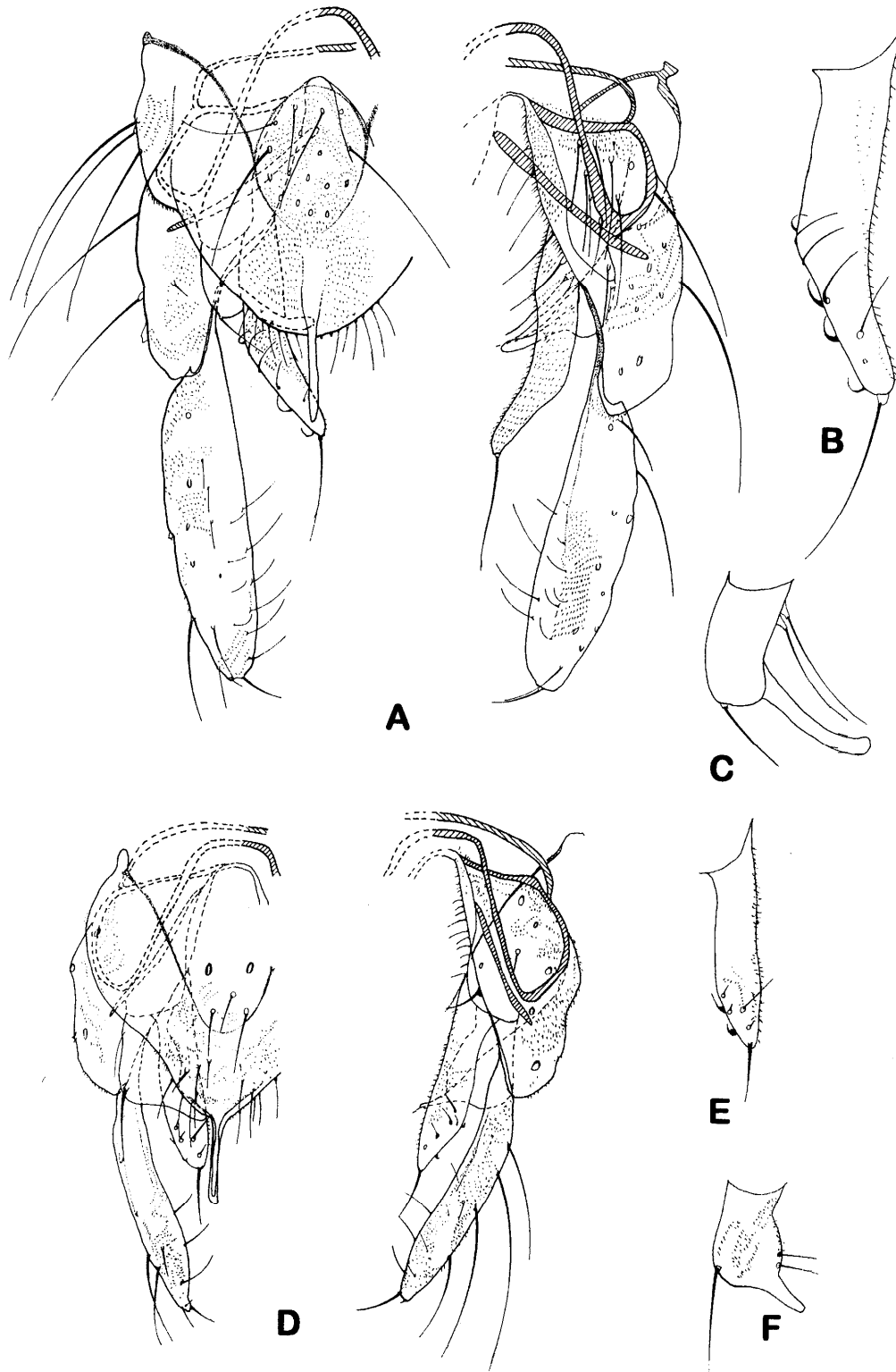


Fig. 8. *Polypedilum (Uresipedilum)* spp., male imago : A-C. *P. (U.) lehmanni* sp. n ; A. Hypopygium ; B. Superior volsella ; C. Inferior volsella. D-F. *P. (U.) gladysae* sp. n. : D. Hypopygium ; E. Superior volsella ; F. Inferior volsella.

Fig. 8. *Polypedilum (Uresipedilum)* spp., imago mâle. A-C. *P. (U.) lehmanni* n. sp. ; A. Hypopyge ; B. Volsella supérieure ; C. Volsella inférieure ; D-F. *P. (U.) gladysae* n. sp. ; D. Hypopyge ; E. Volsella supérieure ; F. Volsella inférieure.

Wing. VR 1.28. Brachiolum with 1 seta, R with 24, R₁ with 18, R₄₊₅ with 46, M with 3 setae. Squama with 10 setae.

Legs. Scale on front tibia 27 µm long. Spurs on middle tibia 58 µm long, on hind tibia 59 µm long.

Comb on middle tibia 27 µm long, long and short comb on hind tibia 27 and 24 µm long respectively. Width at apex of front tibia 56 µm, of middle tibia 58 µm, of hind tibia 73 µm. Lengths (in mm and proportions of legs :

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	972	673	1050	787	577	459	167	1.56	1.35	0.57	2.5
p ₂	1047	876	491	285	189	128	64	0.56	3.63	3.91	0.2
p ₃	1107	1007	730	392	338	199	89	0.72	3.79	2.90	0.2

Hypopygium (Fig. 8 A-C). Tergite IX with 17 median setae, altogether 20 posterior setae to each side of anal point. Laterosternite IX with 3 setae. Anal point 31 µm long, 9 µm wide at base, gradually tapering to nearly parallel-sided towards 7 µm wide apex. Transverse sternapodeme 33 µm long, phallapodeme 119 µm long. Gonocoxite 186 µm long. Total length of superior volsella including apicomedial projection 78 µm, apicomedial projection 58 µm long ; base with 2 inner and 1 apical setae, without microtrichiae. Inferior volsella 138 µm long, parallel sided, slender, with prominent apical seta. Gonostylus 189 µm long. HR 0.99.

Pupa

(n= 1)

Total length about 5.2 mm. Exuviae cephalothorax, margins of segments and caudolateral spur brown.

Cephalothorax. Cephalic tubercles barely indicated. Frontal setae barely indicated. Prealar tubercle apparently absent.

Abdomen (Fig. 9 A). Tergite I bare ; tergites II-VI each with strong anterior row of spinules and strong median and posterior band of shagreen, extensive on II-V ; tergites VII and VIII each with two anteriomedian spots of shagreen ; tergite IX bare. Sternites bare. Tergite II with 26 caudal hooklets. Conjunctive IV/V with 33 irregular biserial spines which appear to be divided into two parts. Pedes spurii A well developed on segment IV. Pedes spurii B well developed on I and II. Anal spur (Fig. 9 B) with strong apical tooth, 1 strong lateral tooth, and 3-5 minute lateral teeth.

Abdominal setation : Segment I without L setae ; II and III each with 1 ; IV with 3 L setae, none taeniate ; V and VI each with 3 taeniate L setae ; VII and VIII each with 4 taeniate L setae. Fringe of anal lobe with 25 and 29 taeniae on each side, no dorsal seta.

Remarks. - This species is similar to *P. (U.) spinibojum* and *P. (U.) plautum* but separable from these spe-

cies by having a longer apicomedial projection and different thorax coloration.

Distribution. - Known only from Zaire.

***Polypedilum (Uresipedilum) spinibojum* sp. n.**

(Figs. 3 E, 10)

Type locality. - TANZANIA : Tanga Region, West Usambara Mts. Mazumbai, Kaputu.

Type material. - Holotype ♂, here designated, TANZANIA : Tanga Region, West Usambara Mts., Mazumbai, Kaputu, Malaise trap st. 10. XI. 199, ZMB Tanzania expedition (ZMBN Type No. 271). Paratypes : 13 ♂, as holotype (ZMBN) same data as holotype.

Diagnostic characters. - Differs from other members of the subgenus in a spine on antepnotum.

Etymology. - From Latin, *spina*, meaning spine, and *boja*, meaning collar, referring to the spine on the antepnotum.

Male imago

(n= 10, except when otherwise stated).

Total length 3.31-4.07, 3.70 mm. Wing length 2.13-2.42, 2.26 mm. Total length/ wing length 1.52-1.73, 1.63. Wing length/ length of profemur 2.07-2.32, 2.21.

Coloration. Thorax yellow to dark brown (Fig. 3 E) and abdomen yellow (as in Fig. 4 F). Femur, tibia and tarsi yellow.

Head (Fig. 10 A). AR 1.61-1.91, 1.71. Ultimate flagellomere 700-899, 792 µm long. Temporal setae 7-13, 11 ; including 3-6, 4 inner verticals ; 2-6, 4 outer verticals ; and 1-4, 2 postorbitals. Clypeus with 15-21, 19 setae. Tentorium 91-182, 159 µm long ; 33-51, 42 µm wide at sieve pore ; 6-13, 9 µm wide at posterior tentorial pit. Stipes 111-204, 157 µm long. Palpomere lengths (in µm) : 33-53, 42 ; 44-60, 52 ; 167-200, 182 (8) ; 153-183, 164 (7) ; 171-286, 244 (6). Fifth / third palpomere 0.92-1.60, 1.35 (6). Third palpomere with 2 sensilla clavata.

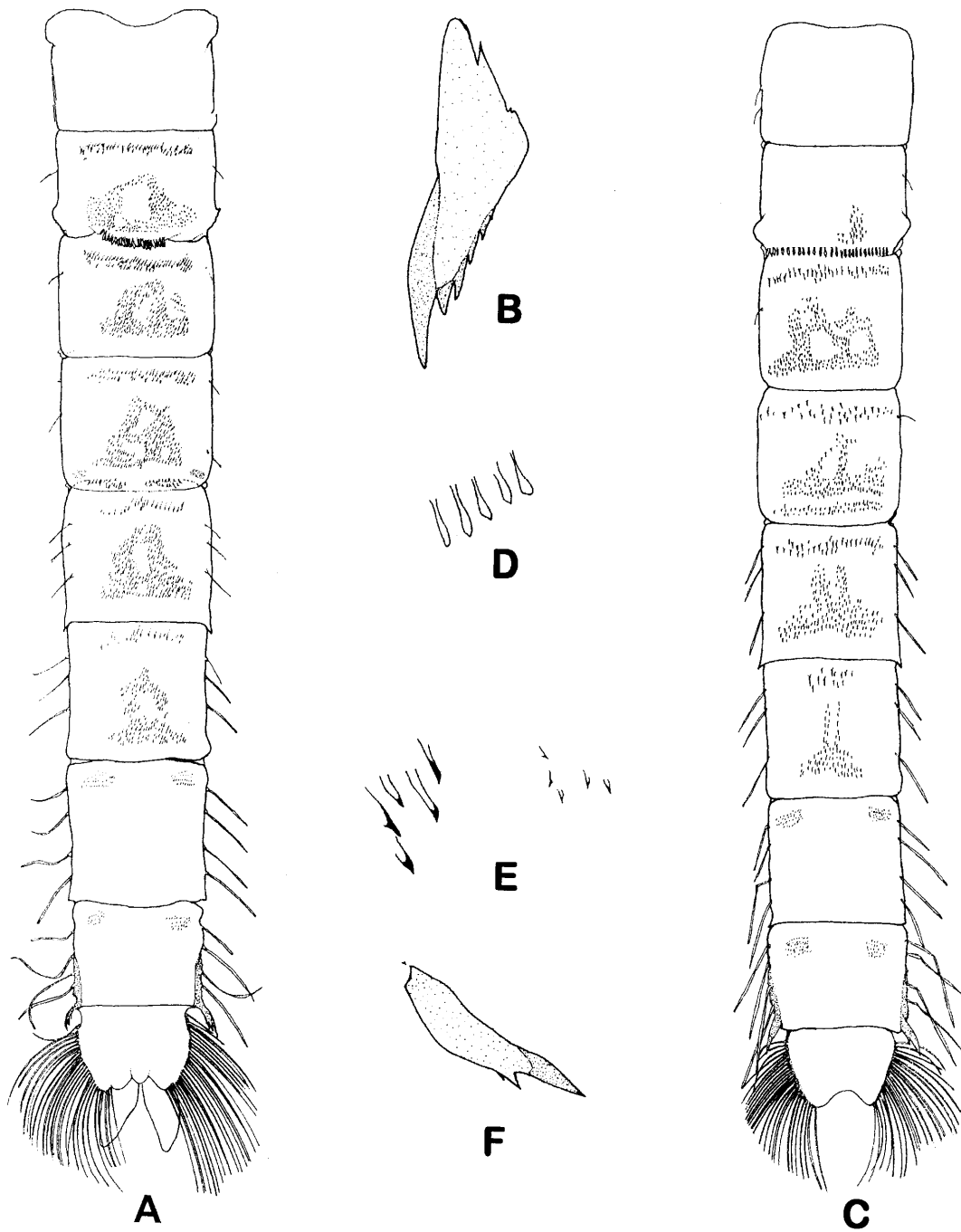


Fig. 9. *P. (Uresipedilum)* spp., pupa : A-B. *P. (U.) lehmanni* sp. n. ; A. Abdomen ; B. Anal spur ; C-F. *P. (U.) plautum* sp. n. : C. Abdomen ; D. Tergite II hooklets ; E. Tergite II spinules and shagreen ; F. Anal spur.

Fig. 9. *P. (Uresipedilum)* spp., nymphe. A-B. *P. (U.) lehmanni* n. sp. A. Abdomen ; B. Eperon anal ; C-F. *P. (U.) plautum* n. sp. C. Abdomen ; D. Petits crochets du tergite II ; E. Spinules et chagrin du tergite II ; F. Eperon anal.

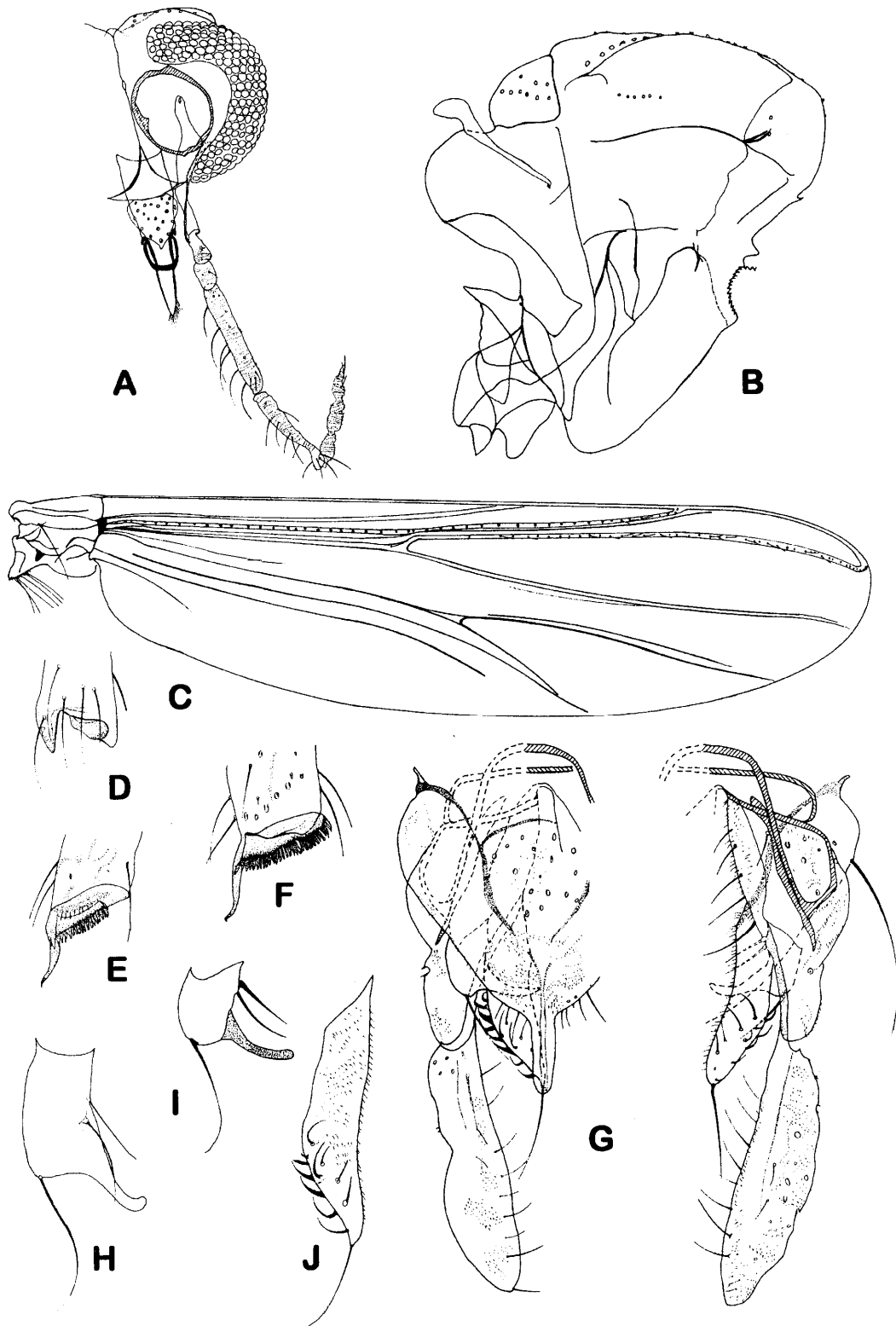


Fig. 10. *P. (U.) spinibojum* sp. n., male imago : A. Head ; B. Thorax ; C. Wing ; D. Fore tibia ; E. Mid tibia ; F. Hind tibia ; G. Hypopygium ; H. Superior volsella ; I. Superior volsella, variation ; J. Inferior volsella.

Fig. 10. *P. (U.) spinibojum* n. sp., imago mâle. A. Tête ; B. Thorax ; C. Aile ; D. Tibia antérieur ; E. Tibia moyen ; F. Tibia postérieur ; G. Hypopyge ; H. Volsella supérieure ; I. Volsella supérieure, variation ; J. Volsella inférieure.

Thorax (Fig. 10 B). Anteprenotum with more or less distinct anteprenotal spine. Acrostichals 18-26, 23 ; dorsocentrals 13-20, 17 ; prealars 4-6, 6. Scutellum with 9-14, 11 (9) setae.

Wing (Fig. 10 C). VR 1.19-1.27, 1.21. Brachiolum with 1 seta ; R with 24-30, 27 ; R₁ with 20-27, 23 ; R₄₊₅ with 40-50, 26 ; M with 1-5, 4 (6) ; RM with 1-2 (2) setae. Squama with 8-10, 10 setae.

Legs. Scale on front tibia (Fig. 10 D) 22-36, 31 μ m long. Spurs on middle tibia (Fig. 10 E) 42-64, 57 μ m long ; on hind tibia (Fig. 10 F) 53-73, 61 μ m long. Comb on middle tibia 14-27, 20 μ m long ; long and short comb on hind tibia 12-42, 21 μ m and 12-31, 20 μ m long respectively. Width at apex of front tibia 51-78, 60 μ m ; of middle tibia 49-64, 58 μ m ; of hind tibia 62-73, 67 μ m. Lengths (in mm) and proportions of legs as :

	fe	ti	ta ₁	ta ₂
p ₁	997-1161, 1052	673-801, 748	1178 (1)	844 (1)
p ₂	9.51- 1285, 1117	712-1050, 950	523- 570, 544 (5)	302-331, 310 (5)
p ₃	1060-1299, 1174	954-1161, 1075	790-797 (2)	409-434 (2)
	ta ₃	ta ₄	ta ₅	LR
p ₁	614 (1)	477 (1)	182 (1)	1.57 (1)
p ₂	214-233, 225 (5)	135-210, 156 (5)	53-75, 67 (5)	0.44-0.59, 0.53 (5)
p ₃	352-367 (2)	189-217 (2)	84-89 (2)	0.70-0.74 (2)
	BV	SV	BR	
p ₁	1.42 (1)	1.55 (1)	3.4 (1)	
p ₂	3.28-3.73, 3.54 (5)	3.77-4.10, 3.92 (5)	3.3-3.9, 3.6 (5)	
p ₃	2.68-2.90 (2)	2.79-2.96 (2)	3.3-4.6 (2)	

Hypopygium (Fig. 10 G-J). Tergite IX with 16-23, 19 median setae ; altogether 12-18, 16 posterior setae to each side of anal point. Laterosternite IX with 1-5, 3 setae. Anal point 73-129, 113 μ m long ; 44-124, 98 μ m wide at base, gradually tapering to nearly parallel-sided towards 4-7, 6 μ m wide apex. Transverse sternapodeme 21-56, 35 μ m long ; phallapodeme 88-144, 111 μ m long. Gonocoxite 178-220, 197 μ m long. Total length of superior volsella including apicomedial projection 60-89, 77 μ m ; apicomedial projection 24-44, 35 (9) μ m long ; base with 2 inner and 1 apical setae, bare. Inferior volsella 100-171, 144 μ m long ; parallel sided and with a prominent apical seta. Gonostylus 188-240, 222 μ m long. HR 0.82-0.94, 0.89 ; HV 1.57-1.89, 1.70.

Remarks. - The most striking feature of *P. (U.) spinibojum* is the spine on the anteprenotum, none of the other species described here have it. There are slight individual variations in the shape of the superior volsella within the species.

Distribution. - Known only from Tanzania, Tanga Region, West Usambara Mts., Mazumbai, Kaputu.

***Polypedilum (Uresipedilum) annulatum* Freeman**
(Figs. 3 A, 4 D, 7 C-K)

Polypedilum (Polypedilum) annulatum Freeman, 1954 : 22 ; 1958 : 295, *pro parte nec Polypedilum (Polypedilum) annulatum* Freeman, 1958 : 295, *pro parte* [= *P. (U.) praegnans* sp. n. and *P. (U.) harrisoni* sp. n.]

nec Polypedilum (Polypedilum) annulatum Harrison, 1996 : 78 [= *P. (U.) harrisoni* sp. n.]

Material examined. - SOUTH AFRICA : Cape Province, Kirstenbosch, paratype, ♂, 25. XI. 1952, K. M. F. Scott. (BMNH, B. M. 1953-79) ; Wellington, 1 ♂, 29. XI. 1955, (BMNH, B. M. 195) ; Natal, Mooi R., Kamberg Game Reserve, 1 ♂, 14-30. IX. 1953, A. D. Harrison, (BMNH, B. M. 1954-280).

Diagnostic characters. - Differs from other banded abdomen members of the subgenus in having no setae on the superior volsella, and very high setal counts on the wing veins.

Male imago

(n= 2-3, except when otherwise stated).

Total length 3.74-3.78 mm. Wing length 1.96-2.11 mm. Total length/ wing length 1.66-2.03. Wing length/ length of profemur 2.28-2.62.

Coloration. Thorax almost completely brown (Fig. 3 A) and abdomen brown with dark brown bands (Fig. 4 D). Femur, tibia and tarsi pale yellow.

Head (Fig. 7 C). AR 1.22-1.64. Ultimate flagellomere 544-702 μm long. Temporal setae 11-17 including 4-7 inner verticals, 4-5 outer verticals, and 5-8 postorbitals. Clypeus with 12-20 setae. Tentorium 167-180 μm long, 33-42 μm wide at sieve pore and 7-11 μm wide at posterior tentorial pit. Stipes 95-162 μm long. Palpomere lengths (in μm): 36-47, 42-47, 144-180, 139-159, 215-231. Fifth / third palpomere 1.42-1.50. Third palpomere with 2 sensilla clavata.

Thorax (Fig. 7 D). Acrostichals 24-28, dorsocentrals 17-22, prealars 5-7. Scutellum with 18 setae.

Wing (Fig. 7 E). VR 1.66-1.24. Brachiolum with 1 seta; R with 20-26; R₁ with 18-22; R₄₊₅ with 31-47; M with 2-5 setae. Squama with 7-11 setae.

Legs. Scale on front tibia (Fig. 7 F) 31-38 μm long. Spurs on middle tibia (Fig. 7 G) 54-68 μm long, on hind tibia (Fig. 7 H) 60-84 μm long. Comb on middle tibia 13-27 μm long, long and short comb on hind tibia 28-29 μm and 20-27 μm long respectively. Width at apex of front tibia 44-58 μm , of middle tibia 54-62 μm , of hind tibia 60-71 μm . Lengths (in mm) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	
p ₁	826-1011	591-662	986-1024	680-751	513-520	
p ₂	961-1050 (1)	787-844	499-488	253-288	206-239	
p ₃	951-1129	904-1053	374-712	356-420	299-356	
	ta ₄	ta ₅	LR	BV	SV	BR
p ₁	381-402	125-146	0.65-1.67	1.36-1.45	1.41-1.50	2.8 (1)
p ₂	117-151	53-61	0.56-0.62	3.37-3.61	3.72-3.92	-
p ₃	171-221	64-85	0.65-0.77	2.72-2.81	2.65-3.12	5.2 (1)

Hypopygium (Fig. 7 I-K). Tergite IX with 19-26 median setae, altogether 16-20 posterior setae to each side of anal point. Laterosternite IX with 2-6 setae. Anal point 56-83 μm long, 29-33 μm wide at base, gradually tapering to nearly parallel-sided towards 4-7 μm wide apex. Transverse sternapodeme 42-60 μm long, phallopodeme 89-100 μm long. Gonocoxite 199-218 μm long. Total length of superior volsella including apicomedial projection 77-78 μm ; apicomedial projection 30-31 μm long; base with 2 inner and 1 apical setae, microtrichiae absent. Inferior volsella 133-142 μm long, parallel sided and with prominent apical seta. Gonostylus 206-220 μm long. HR 0.97-0.99, HV 1.75-1.79.

Remarks. - The shape of the superior volsella is similar to *P. (U.) spinibojum* and *P. (U.) plautum*, but the species can be distinguished from these by the banded abdomen and the coloration pattern.

Distribution. - Known from waterbodies in South Africa.

***Polypedilum (Uresipedilum) plautum* sp. n.**

(Figs. 3 I, 11, 9 C-F)

Polypedilum convictum Lehmann, 1981 : 31, *nec* Walker, 1856 : 161

Type locality. - SOUTH AFRICA : Natal Province, Cathedral Peak, Indumeni Forest.

Type material. - Holotype ♂, here designated, SOUTH AFRICA : Natal Province, Cathedral Peak, Indumeni Forest, 1. X. 1991, B. R. Stuckenberg (ZMBN Type No. 272). Paratypes : SOUTH AFRICA : Natal Province, Cathedral Peak, Doreen Falls, 1 ♀, 2. X. 1991, B. R. Stuckenberg (ZMBN); Natal Province, Howick, Karkloof Forest, 19. XI. 1963, Haeselbarth (ZSM). TANZANIA : Tanga Region, West Usambara Mts., Mazumbai, Kaputu, 2 ♂, 28. II. 1990, Light trap, 4. II. 1990, Sweep net., ZMB Tanzania Expedition, (ZMBN); ZAIRE : Kisangani, 2 ♂ with one associated pupal exuvia misidentified as *P. convictum*, 28. IV. 1975, J. Lehmann (ZSM, No. EI 1980).

Diagnostic characters. - Differs from other members of the subgenus in having postnotum and vittae brown.

Etymology. - From Latin *plautum*, meaning flat-footed, referring to the shape of the superior volsella.

Male imago

(n= 5-6 except when otherwise stated).

Total length 3.31-3.72, 3.46 mm. Wing length 1.82-2.29, 2.17 mm. Total length/ wing length 1.49-1.81, 1.61. Wing length/ length of profemur 1.96-2.50, 2.20.

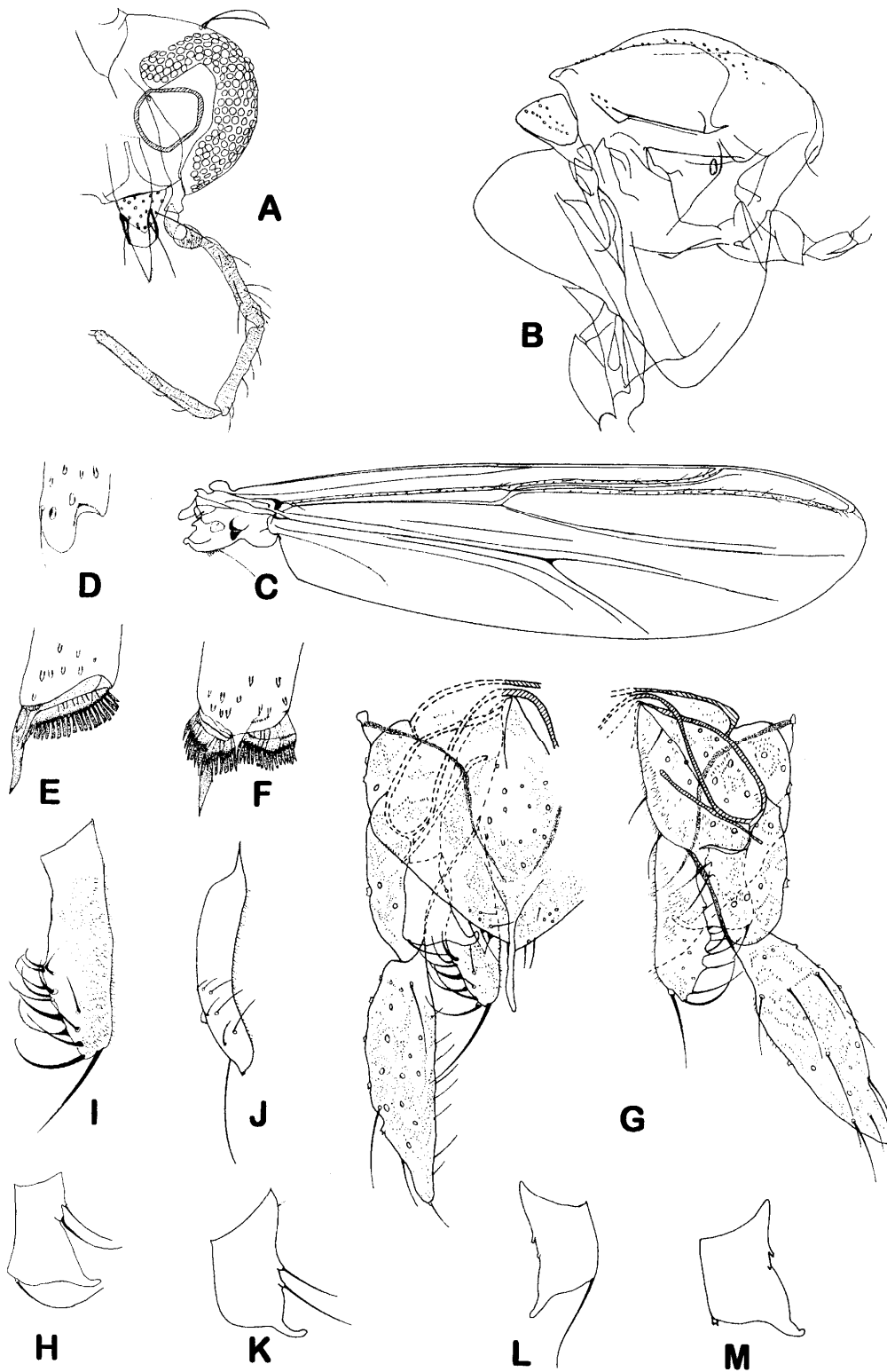


Fig. 11. *P. (U.) plautum* sp. n., male imago : A. Head ; B. Thorax ; C. Wing ; D. Fore tibia ; E. Mid tibia ; F. Hind tibia ; G. Hypopygium ; H. Superior volsella ; I. Inferior volsella of holotype ; J. Inferior volsella, variation ; K-M. Superior volsella, variation.

Fig. 11. *P. (U.) plautum* n. sp., imago mâle. A. Tête ; B. Thorac ; C. Aile ; D. Tibia antérieure ; E. Tibia moyen ; F. Tibia postérieure ; G. Hypopyge ; H. Volsella supérieure ; I. Volsella inférieure de l'holotype ; J. Volsella inférieure, variation ; K-M. Volsella supérieure, variation.

Coloration. Thorax with postnotum and vittae brown (Fig. 3 I), abdomen pale yellow as in Fig. 4 F. Femur, tibia and tarsi yellow.

Head (Fig. 11 A). AR 1.23-1.90, 1.51. Ultimate flagellomere 268-733, 536 µm long. Temporal setae 6-15, 10 ; including 2-4, 3 inner verticals ; 2-5, 3 outer verticals ; and 2-3 postorbitals. Clypeus with 13-21, 17 setae. Tentorium 140-155, 146(4) µm long ; 27-48, 39 (4) µm wide at sieve pore ; 6-12, 9 (4) µm wide at posterior tentorial pit. Stipes 78-144, 124 (4) µm long. Palpomere lengths (in µm) : 34-44, 39 ; 36-47, 42 ; 128-213, 166 ; 120-186, 145 ; 214-270, 193. Fifth / third palpomere 1.27-1.68 (3). Third palpomere with 3 sensilla clavata.

Thorax (Fig. 11 B). Acrostichals, 11-27, 19 ; dorso-

centrals 16-25, 19 ; prealars 4-6, 5. Scutellum with 9-17 setae.

Wing (Fig. 11 C). VR 1.20-1.28, 1.25. Brachiolum with 1-5, 2 setae ; R with 23-26, 24 ; R₁ with 18-26, 22 ; R₄₊₅ with 38-46, 43 setae ; M bare. Squama with 9-14, 12 setae.

Legs. Scale on front tibia (Fig. 11 D) 26-32, 30 µm long. Spurs on middle tibia (Fig. 11 E) 44-58, 52 µm long, on hind tibia (Fig. 11 F) 53-64, 60 µm long. Comb on middle tibia 12-24, 22 µm long, long and short comb on hind tibia 24-36, 29 µm and 11-32, 26 µm long respectively. Width at apex of front tibia 44-53, 49 µm ; of middle tibia 49-60, 56 µm ; of hind tibia 56-70, 62 µm. Lengths (in mm) and proportions of legs (n= 4-5) :

	fe	ti	ta ₁	ta ₂
p ₁	850-1144, 985	619-816, 692	1022-1208, 1103	758-904, 819
p ₂	936-1184, 1038	776-1040, 879	452-544, 502	249-304, 273
p ₃	958-1240, 1084	908-1152, 1017	662-800, 740	363-464, 399
	ta ₃	ta ₄	ta ₅	LR
p ₁	513-608, 559	406-520, 473	146-208, 175	1.48-1.70, 1.60
p ₂	171-212, 187	107-136, 121	46-57, 52	0.58-0.64, 0.60
p ₃	288-376, 326	164-240, 199	64-88, 77	0.68-0.78, 0.73
	BV	SV	BR	
p ₁	1.35-1.42, 139	1.47-1.62, 1.53	1.8-3.4, 2.4	
p ₂	3.52-3.75, 3.67	3.33-3.79, 3.62	2.2-4.6 (3)	
p ₃	2.72-2.93, 2.84	2.67-3.05, 2.84	3.1-5.1 (3)	

Hypopygium (Fig. 11 G-M). Tergite IX with 10-15, 13 median setae ; altogether 10-22, 17 (4) posterior setae to each side of anal point. Laterosternite IX with 2-4, 3 (4) setae. Anal point 54-93 (3) µm long, 33 (3) µm wide at base, gradually tapering to nearly parallel-sided towards 4-7 (3) µm wide apex. Transverse sternapodeme 22-40, 32 µm long ; phallapodeme 82-110, 97 µm long. Gonocoxite 149-189, 167 µm long. Total length of superior volsella including apicomedia projection 56-89, 71 µm ; apicomedia projection 10-34, 21 µm long ; base with 2 inner and 0-1, 1 apical setae, without microtrichiae. Inferior volsella 109-140, 127 µm long ; parallel sided and with prominent apical seta. Gonostylus 122-216, 184 µm long. HR 0.81-1.24, 0.81 (4) ; HV 1.56-2.00, 1.78.

Pupa

(n= 1)

Total length about 4.5 mm. Exuviae cephalothorax, margins of segments and caudolateral spur brown.

Cephalothorax. Cephalic tubercles barely indicated or absent. Frontal setae broken. Prealar tubercle apparently absent.

Abdomen (Fig. 9 C). Tergite I bare, tergites II-VI each with extensive strong median and posterior band of shagreen (Fig. 9 E) ; tergites VII and VIII each with two anteriolateral spots of shagreen ; tergite IX bare. Sternite II with small and weak anterior spinules, rest of sternites apparently bare. Conjunctives without spinules. Sternite II with a single row of 27 caudal hooklets (Fig. 9 D). Pedes spurii A absent. Pedes spurii B well developed on I and II. Anal spur (Fig. 9 F) with strong apical tooth, 1 strong lateral tooth, and 0-1 minute lateral tooth.

Abdominal setation : Segment I-III each with 1 L seta ; IV with 3 L setae, none taeniate ; V and VI each with 3 taeniate L setae, VII and VIII each with 4 taeniate L setae. Fringe of anal lobe with 25 taeniae, no dorsal seta.

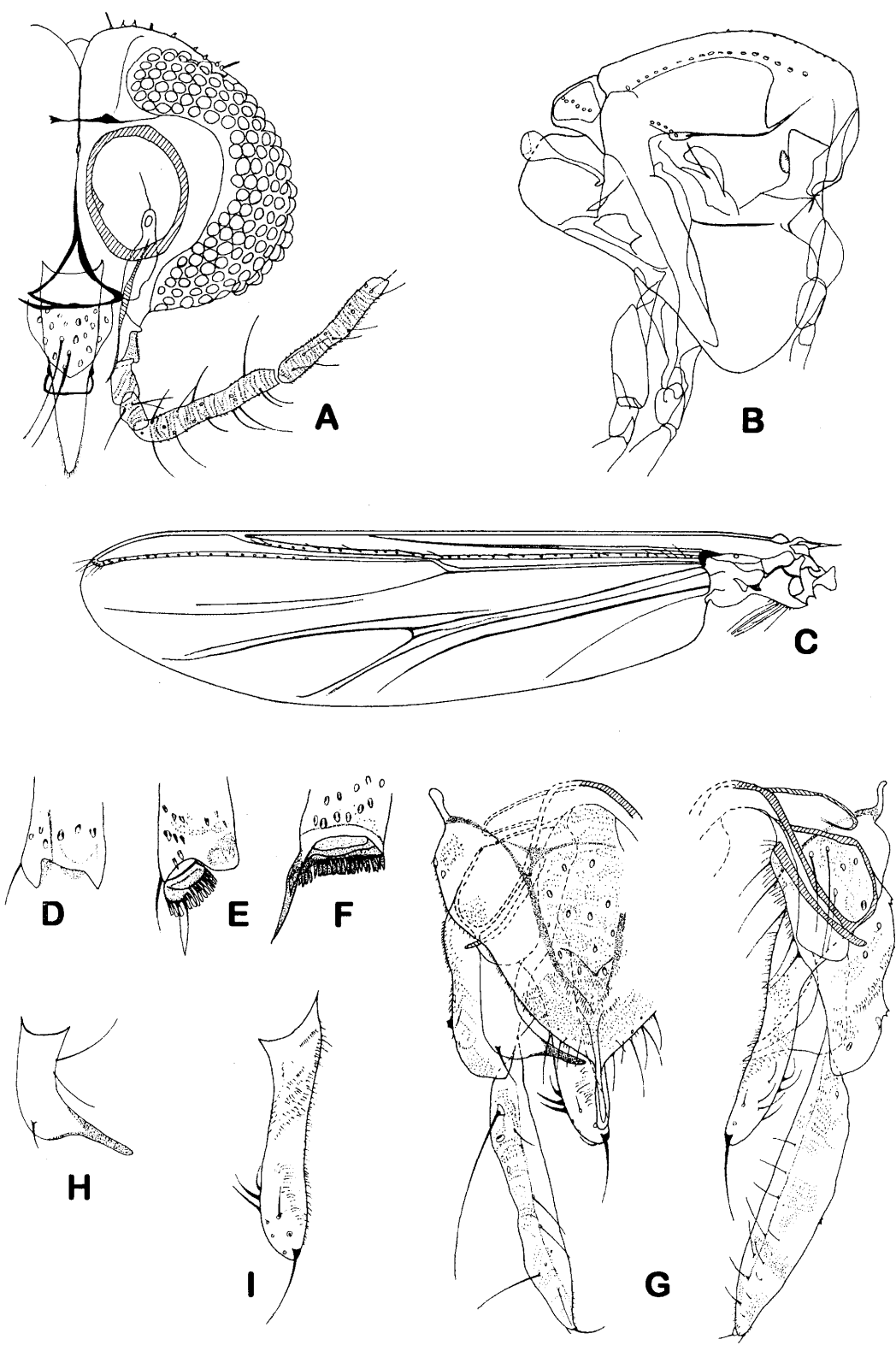


Fig. 12. *P. (U.) kakumense* sp. n., male imago : A. Head ; B. Thorax ; C. Wing ; D. Fore tibia ; E. Mid tibia ; F. Hind tibia ; G. Hypopygium ; H. Superior volsella ; I. Inferior volsella.

Fig. 12. *P. (U.) kakumense* n. sp., imago mâle. A. Tête ; B. Thorax ; C. Aile ; D. Tibia antérieur ; E. Tibia moyen ; F. Tibia postérieur ; G. Hypopyge ; H. Volsella supérieure ; I. Volsella inférieure.

Remarks. - This species is similar to *P. (U.) spinibojum* and *P. (U.) annulatum*, but they are distinct from each other in the coloration pattern of thorax and abdomen. *P. (U.) plautum* has no setae on M.

Distribution. - The species is known from South Africa, Zaire and Tanzania.

***Polypedilum (Uresipedilum) kakumense* sp. n.**

(Fig. 12)

Type locality. - GHANA : Central Region, Kakum National Park.

Type material. - Holotype ♂, here designated, GHANA : Central Region, Kakum National Park, 8-18. XI. 1994, NUFU project (ZMBN, Type No. 276). Paratype : 1 ♂, as holotype.

Diagnostic characters. - Differs from other members of the subgenus in having clear to pale yellow coloration of both the abdomen and the thorax. Amongst species with bare superior volsella it is the only one with slender superior volsella with straight medial projection.

Etymology. - Named after Kakum National Park Central Region, Ghana, and the Latin suffix *-ense* denoting place, locality.

Male imago

(n= 1-2).

Total length 2.62-2.96 mm. Wing length 1.33-1.60 mm. Total length/ wing length 1.84-1.97. Wing length/ length of profemur 1.82-2.03.

Coloration. Thorax and abdomen clear or pale yellow as in Figs. 3 J, 4 F. Femur, tibia and tarsi yellow.

Head (Fig. 12 A). AR 1.66. Ultimate flagellomere 591-650 µm long. Temporal setae 9-12 including 2-3 inner verticals, 4 outer verticals, and 2-6 postorbitals. Clypeus with 16-20 setae. Tentorium 144-145 µm long, 27-31 µm wide at sieve pore and 7-13 µm wide at posterior tentorial pit. Stipes 82-147 µm long. Palpomere lengths (in µm) : 27-29, 33-38, 38-144, 131-144, 202. Fifth / third palpomere 1.40. Third palpomere with 2 sensilla clavata.

Thorax (Fig. 12 B). Acrostichals 18-20, dorsocentrals 11-17, prealars 3-5. Scutellum with 8-11 setae.

Wing (Fig. 12 C). VR 1.17-1.20. Brachiolum with 1 seta, R with 17-23, R₁ with 14, R₄₊₅ with 21-25 setae, M bare. Squama with 9-10 setae.

Legs. Scale on front tibia (Fig. 12 D) 20-22 µm long, rounded. Spurs on middle tibia (Fig. 12 E) 53-56 µm long, on hind tibia (Fig. 12 F) 51-62 µm long. Comb on middle tibia 18-22 µm long, long and short comb on hind tibia 22-27 µm and 18-20 µm long respectively. Width at apex of front tibia 40-51 µm, of middle tibia 42-51 µm, of hind tibia 49-53 µm. Lengths (in mm) and proportions of legs :

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p ₁	744-801	484-568	815-940	623-719	424-477	342-388
p ₂	701-794	605-723	217-244	164-182	164-182	96-103
p ₃	659-879	662-776	509-605	278-352	249-288	142-189
	ta ₅	LR	BV	SV	BR	
p ₁	132-153	1.66-1.68	1.33-1.34	1.46-1.51	2.5-3.2	
p ₂	36-50	0.54-0.56	3.17-3.46	3.82-3.87	3.7	
p ₃	61-71	0.77-0.78	2.51	2.59-2.74	1.3-5.9	

Hypopygium (Fig. 12 G-I). Tergite IX with 12-17 median setae, altogether 16-18 posterior setae to each side of anal point. Laterosternite IX with 3 setae. Anal point 67-89 µm long, 78-100 µm wide at base, gradually tapering to nearly parallel-sided towards apex which is 4 µm wide. Transverse sternapodeme 20-22 µm long, phallapodeme 78-82 µm long. Gonocoxite 151-158 µm long. Total length of superior volsella including apicomedial projection 78 µm ; apicomedial projection 24-27 µm long ; base with 2 inner and 1 apical setae, without microtrichiae. Inferior volsella 89-

135 µm long, parallel sided and with prominent apical seta. Gonostylus 158-167 µm long. HR 0.91-1.00, HV 1.68-1.79.

Distribution. - The species is known from the rivers in Kakum National Park, Ghana.

4.4.5. *kibatiense* group

Imagines moderately large to large ; fore tibial scale mostly with apical spur, but rounded in *P. (U.) praeagnans* and *P. (U.) harrisoni* ; number of setae on squa-

ma less than 8 except in *P. (U.) tesfayi* and *P. (U.) acutulum* and less than 30 setae on R_{4+5} except in *P. (U.) tesfayi*; superior volsella [Figs 15 H; 16 B, D, E; 17 B, C; Freeman 1959 fig. 5 g for *P. (U.) canum*; Freeman 1959 fig. 5 f for *P. (U.) cumberi*; Freeman 1959 fig. 5 d for *P. (U.) harrisi*; Harrison 1994 fig. 137 for *P. (U.) tesfayi*] with apex straight, rounded or projecting; base either with microtrichiae present at base only, or at apex only, often without inner setae, often with 2 or more apical setae; anal tergite often with less than 10 median setae, anal tergite bands absent in *P. (U.) praegnans*, weak to distinct in the other species, sometimes fused basal to median setae.

Known pupa with cephalic tubercles reduced to low humps, frontal setae short or absent, prealar tubercle present, tergite II with strong spinules in anterior band, conjunctive III/IV with spinules.

The larvae of the group are unknown.

Included species: *P. (U.) acutulum*, *P. (U.) kibatiense*, *P. (U.) gladysae*, *P. (U.) freemani*, *P. (U.) harrisi*, *P. (U.) cumberi*, *P. (U.) canum*, *P. (U.) harrisi*, *P. (U.) praegnans*, *P. (U.) harrisoni*, and perhaps *P. (U.) tesfayi*.

***Polypedilum (Uresipedilum) tesfayi* Harrison**

Polypedilum (Polypedilum) tesfayi Harrison, 1996: 80, figs 136-139.

This species from Addis Ababa, Ethiopia, has been extensively described by Harrison (1996). The species belongs to *Polypedilum (Uresipedilum)* as shown by the shape of the superior volsella. It is tentatively placed as the most basal plesiomorphic species of the *kibatiense* group. The superior volsella is similar to *Polypedilum (Uresipedilum) dossenuidum* sp. n. described above.

***Polypedilum (Uresipedilum) acutulum* sp. n.**

(Figs. 3 G, 13)

Type locality. - GHANA: Western Region, Ankasa Game Production Reserve.

Type material. - Holotype ♂, here designated, GHANA: Western Region, Ankasa Game Production Reserve, 6-12. XII. 1993, NUFU project (ZMBN Type No. 275).

Diagnostic characters. - Differs from other members of the subgenus in having AR less than 1 and the median projection of the superior volsella pointed.

Etymology. - From Latin *acutulum*, referring to the tiny structure and pointed nature of the medial projection of the superior volsella.

Male imago

(n= 1).

Total length 1.92 mm. Wing length 1.13 mm. Total length/ wing length 1.70. Wing length/ length of profemur 2.33.

Coloration. Thorax with 3 brown spots on postnotum, anteprototum and part of preepisternum (Fig. 3 G); abdomen yellow as in Fig. 4 F. Femur, tibia and tarsi yellow.

Head (Fig. 13 A). AR 0.74. Ultimate flagellomere 273 µm long. Temporal setae 6 including 2 inner verticals, 2 outer verticals, and 2 postorbitals. Clypeus with 10 setae. Tentorium 73 µm long, 10 µm wide at sieve pore and 4 µm wide at posterior tentorial pit. Stipes 69 µm long. Palpomere lengths (in µm): 16, 27, 42, 60, 73. Fifth / third palpomere 1.74. Third palpomere with 3 sensilla clavata.

Thorax (Fig. 13 B). Acrostichals 16, dorsocentrals 10, prealars 3. Scutellum with 3 setae.

Wing (Fig. 13 C). VR 1.24. Brachiolum with 1 seta, R with 17, R_1 with 7, R_{4+5} with 18, M with 2 setae. Squama with 9 setae.

Legs. Scale on front tibia (Fig. 13 D) 24 µm long including minute apical spine. Spurs on middle tibia (Fig. 13 E) 44 µm long, on hind tibia (Fig. 13 F) 44 µm long. Comb on middle tibia 13 µm long, long and short comb on hind tibia 16 µm and 11 µm long respectively. Width at apex of front tibia 31 µm, of middle tibia 31 µm, of hind tibia 24 µm. Lengths (in mm) and proportions of legs:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
p1	495	245	644	395	263	171	75	2.60	1.54	1.15	5.0
p2	516	381	239	103	64	36	30	0.63	4.87	3.76	5.4
p3	570	495	331	173	141	36	30	0.63	4.87	3.76	5.4

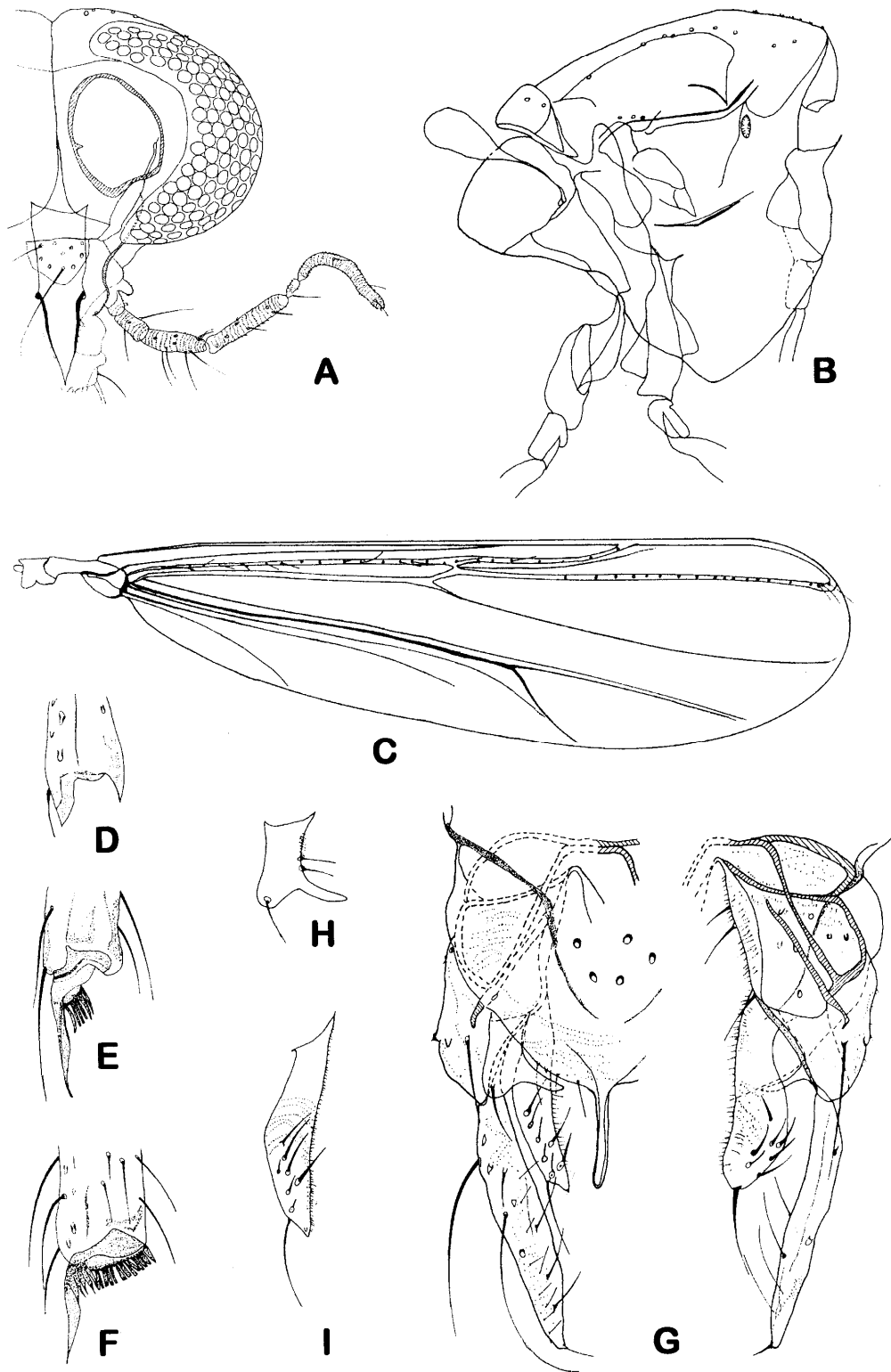


Fig. 13. *P. (U.) acutulum* sp. n., male imago : A. Head ; B. Thorax ; C. Wing, D. Fore tibia ; E. Mid tibia ; F. Hind tibia ; G. Hypopygium ; H. Superior volsella ; I. Inferior volsella.

Fig. 13. *P. (U.) acutulum* n. sp., imago mâle. A. Tête ; B. Thorax ; C. Aile ; D. Tibia antérieur ; E. Tibia moyen ; F. Tibia postérieur ; G. Hypopyge ; H. Volsella supérieure ; I. Volsella inférieure.

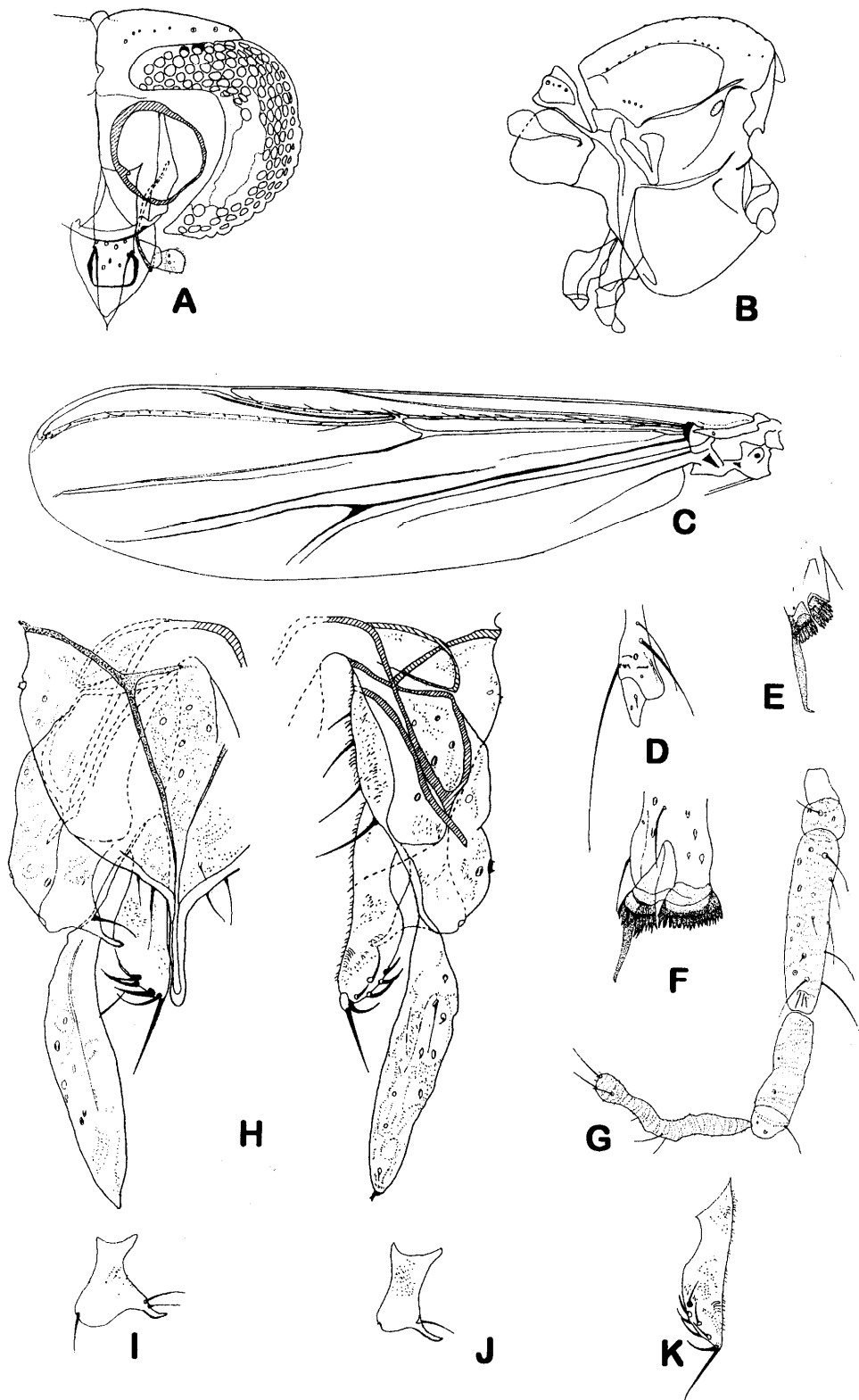


Fig. 14. *P. (U.) kibatiense* Goetghebuer, male imago : A. Head ; B. Thorax ; C. Wing ; D. Fore tibia ; E. Mid tibia ; F. Hind tibia ; G. Palp ; H. Hypopygium ; I, J. Superior volsellae ; K. Inferior volsella.

Fig. 14. *P. (U.) kibatiense* Goetghebuer, imago mâle. A. Tête ; B. Thorax ; C. Aile ; D. Tibia antérieure ; E. Tibia moyen ; F. Tibia postérieure ; G. Palpe labial ; H. Hypopyge ; I, J. Volsella supérieure ; K. Volsella inférieure.

Hypopygium (Fig. 13 G-I). Tergite IX with 5 median setae, altogether 8 posterior setae to each side of anal point. Laterosternite IX with 2 setae. Anal point 44 μm long, 33 μm wide at base, gradually tapering to nearly parallel-sided towards 2 μm wide apex. Transverse sternapodeme 20 μm long, phallapodeme 63 μm long. Gonocoxite 89 μm long. Total length of superior volsella including apicomедial projection 30 μm ; apicomедial projection 13 μm long; base with 2 inner and 1 apical setae, microtrichiae present on dorsal surface. Inferior volsella 87 μm long, parallel sided and with prominent apical seta. Gonostylus 104 μm long. HR 0.85, HV 1.86.

Remarks. - This species is similar to *P. (U.) gladysae* but separable from the latter by the pointed end of the medial projection and the bulbous heel of the superior volsella.

Distribution. - Known only from rivers in the Ankasa Game Production Reserve, Ghana.

***Polypedilum (Uresipedilum) kibatiense* Goetghebuer**

(Figs. 3 H, 14)

Polypedilum kibatiense Goetghebuer, 1936 : 487.

Polypedilum stilatum Freeman, 1955 : 29.

Polypedilum (Polypedilum) kibatiense Goetghebuer ; Freeman, 1958 : 294.

Material examined - ZAIRE : N. Kivu, Kibati, holotype ♀, XI-XII. 1933, (KMMA, No. 3082). ZAIRE : N. Kivu, Rutshuru, holotype ♂ of *P. stilatum*, 25. XII. 1933, (KMMA, No. 132).

Diagnostic characters. - Differs from other members of the subgenus by having the inner setae of the superior volsella placed on the apicomедial projection.

Male imago

(n= 1-2)

Total length not measurable (abdomen incomplete). Wing length 1.50-1.90 mm. Wing length/ length of profemur 2.28-2.31.

Coloration. Thorax dark brown around antepnotum, postnotum and scutellum (Fig. 3 H) ; abdomen lost. Femur, tibia and tarsi pale.

Head (Fig. 14 A). AR 1.41. Ultimate flagellomere 620 μm long. Temporal setae 7-8 including 2-4 inner verticals, 3 outer verticals, and 1-2 postorbitals. Clypeus with 9-11 setae. Tentorium 118-127 μm long, 24-33 μm wide at sieve pore, 2 μm wide at posterior tentorial pit. Stipes 133-135 μm long. Palpomere lengths (in μm) : 29-33, 31-36, 128, 80, 151. Fifth / third palpomere 1.18. Third palpomere with 3 sensilla clavata.

Thorax (Fig. 14 B). Acrostichals 16-18, dorsocentrals 13-15, prealars 4-5. Scutellum with 8 setae.

Wing (Fig. 14 C). VR 1.24-1.27. Brachiolum with 1 seta, R with 16-21, R₁ with 8-9, R₄₊₅ with 23-29 setae, M bare. Squama with 2-7 setae.

Legs. Scale on front tibia (Fig. 14 D) 33-40 μm long including apical spine. Spur on middle tibia (Fig. 14 E) 62 μm long, on hind tibia (Fig. 14 F) 64-68 μm long. Comb on middle tibia 20 μm long, long and short comb on hind tibia 20-27 μm and 18-24 μm long respectively. Width at apex of front tibia 33-46 μm , of middle tibia 44 μm , of hind tibia 31-52 μm . Lengths (in mm) and proportions of legs :

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV
p ₁	662-833	401-534	972	-	-	-	-	-	-	-
p ₂	854	663	424	196	112	66	32	0.64	4.77	3.57
p ₃	662-911	513-765	584	302	217	110	71	0.76	3.22	2.87

Hypopygium (Fig. 14 H-K). Tergite IX with 5-13 median setae, altogether 10 posterior setae to each side of anal point. Laterosternite IX with 3-4 setae. Anal point 67 μm long, 58 μm wide at base, gradually tapering to nearly parallel-sided towards 4 μm wide apex. Transverse sternapodeme 29-31 μm long, phallapodeme 80-87 μm long. Gonocoxite 124-152 μm long. Total length of superior volsella including apicomедial projection 58-71 μm ; apicomедial projection 27 μm

long; base with 1-2 inner and 1 apical setae, microtrichiae present on dorsal surface. Inferior volsella 97-107 μm long, laterally broadened subapically and with prominent apical seta. Gonostylus 133-149 μm long. HR 0.93-1.02.

Remarks. - The species differs from the other species of the subgenus in having the inner setae of the superior volsella placed directly on the apicomедial projection.

Distribution. - Known from Zaire.

The other species belonging to this group are *P. (U.) canum*, *P. (U.) harrisi* and *P. (U.) cumberi*.

***Polypedilum (Uresipedilum) gladysae* sp. n.**

(Fig. 8 D-F)

Type locality. - GHANA : Western Region, Ankasa Game Production Reserve.

Type material. - Holotype ♂, here designated, GHANA : Western Region, Ankasa Game Production Reserve, 6-12. XII. 1993, NUFU project (ZMBN, Type No. 277). Paratypes : 1 ♂, as holotype. TANZANIA : Tanga Region, West Usambara Mts., Mazumbai, Kaputu, 1 ♂, Nov. 1990, ZMB Tanzania expedition (ZMBN).

Diagnostic characters. - Differs from other members of the subgenus in having a slightly bulging inner margin of the superior volsella and a relatively short apicomedial projection.

Etymology. - Named after Gladys Ramirez who was very instrumental in the preparation of most of the slides examined.

Male imago
(n= 3).

Total length 2.02-2.09 mm. Wing length 1.00-1.59 mm. Total length/ wing length 1.80-2.09. Wing length/ length of profemur 2.03-2.34.

Coloration. Thorax with 3 brown spots on postnotum, anteprepronotum and part of preepisternum as in Fig. 3 G ; abdomen yellow as in Fig 4 F. Femur, tibia and tarsi yellow.

Head. AR 1.21-1.28. Ultimate flagellomere 377-528 μ m long. Temporal setae 6-8 including 2-3 inner verticals, 2-3 outer verticals, and 2 postorbitals. Clypeus with 10-11 setae. Tentorium 71-92 μ m long, 16-20 μ m wide at sieve pore, 2-6 μ m wide at posterior tentorial pit. Stipes 60-124 μ m long. Palpomere lengths (in μ m) : 20-32, 24-50, 62-64, 75-77, 97-113. Fifth / third palpomere 1.55-1.76. Third palpomere with 3 sensilla clavata.

Thorax. Acrostichals 12-14, dorsocentrals 6-14, prealars 3-4. Scutellum with 3-4 setae.

Wing. VR 1.25-1.33. Brachiolum with 1 seta, R with 15-17, R₁ with 8-9, R₄₊₅ with 15-28 setae, M bare. Squama with 4-7 setae.

Legs. Scale on front tibia 24-34 μ m long including minute apical spine. Spurs on middle tibia 47 μ m long, on hind tibia 47-66 μ m long. Comb on middle tibia 11-18 μ m long, long and short comb on hind tibia 14-20 μ m and 13-26 μ m long respectively. Width at apex of front tibia 31-42 μ m, of middle tibia 22-44 μ m, of hind tibia 24-50 μ m. Lengths (in mm) and proportions of legs :

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p ₁	434-784	271-424	498-605	345-423	221-287	146-196
p ₂	516-720	277-576	246-256	110-114	68-77	39-43
p ₃	530-800	395-668	324-349	149-183	143	78-82
	ta ₅	LR	BV	SV	BR	
p ₁	78-82	1.84-1.87	1.48-1.52	1.41	3.4-4.2	
p ₂	23-36	0.60-0.65	4.26-4.99	3.66-3.68	4.7-6.1	
p ₃	41-46	0.71-0.82	3.01-3.08	2.89-2.93	7.9-10.3	

Hypopygium (Fig. 8 D-F). Tergite IX with 5-8 median setae, altogether 10-16 posterior setae to each side of anal point. Laterosternite IX with 2-3 setae. Anal point 56-60 μ m long, 46-53 μ m wide at base, gradually tapering to nearly parallel-sided towards 2-3 μ m wide apex. Transverse sternapodeme 20-50 μ m long, phallapodeme 48-94 μ m long. Gonocoxite 89-120 μ m long. Total length of superior volsella including apicomedial projection 44-51 μ m, apicomedial projection

11-21 μ m long ; base with 2 inner and 1 apical setae, microtrichiae present on dorsal. Inferior volsella 71-98 μ m long, parallel sided or laterally broadened subapically, with prominent apical seta. Gonostylus 89-120 μ m long. HR 0.96-1.10, HV 1.93-2.31.

Remarks. - This species is similar to *P. (U.) acutulum*, but can be distinguished by the shape of the superior volsella. *P. (U.) gladysae* has a slightly bulging inner margin of the superior volsella, *P. (U.) acutulum* has a

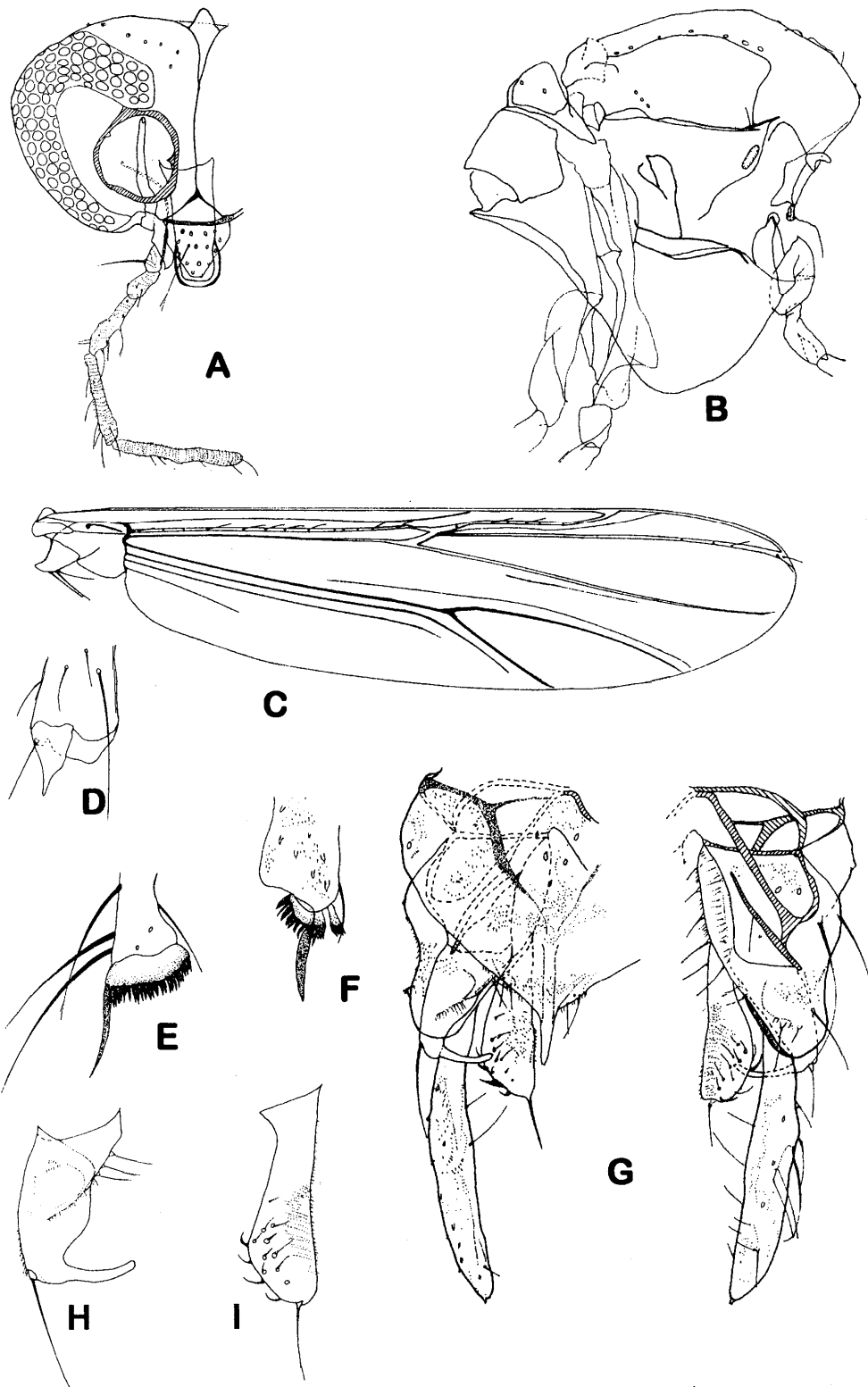


Fig. 15. *P. (U.) freemani* sp. n., male imago : A. Head ; B. Thorax ; C. Wing ; D. Fore tibia ; E. Mid tibia ; F. Hind tibia ; G. Hypopygium ; H. Superior volsella ; I. Inferior volsella.

Fig. 15. *P. (U.) freemani* n. sp., imago mâle. A. Tête ; B. Thorax ; C. Aile ; D. Tibia antérieur ; E. Tibia moyen ; F. Tibia postérieur ; G. Hypopyge ; H. Volsella supérieure ; I. Volsella inférieure.

pointed apicomedial projection, also the latter has an AR of less than 1.

Distribution. - Known from Ghana and Tanzania.

***Polypedilum (Uresipedilum) freemani* sp. n.**

(Figs. 3 C, 4 C, 15)

Polypedilum (Polypedilum) ephippium Freeman, 1958 : 292-294, pro parte.

Material examined. - Holotype ♂, here designated, misidentified *P. ephippium*. SUDAN : Mvolo, VI.-VII. 1954, E. T. M. Reid (BMNH, B. M. 1954-603).

Diagnostic characters. - Differs from other members of the subgenus in the shape of the superior volsella and the coloration pattern.

Etymology. - Named after Paul Freeman, keeper emeritus of entomology at The Natural History Museum (British Museum), London.

Male imago

(n= 1).

Total length not measurable (abdomen broken and incomplete). Wing length 1.4 mm. Wing length/ length of profemur 1.98.

Coloration. Thorax almost completely dark brown (Fig 3 C) and abdomen with segments I, II and IV pa-

le, segments III and V partly dark brown (Fig 4 C). Legs yellowish brown or bright yellow, except for about one third of foreleg femur, ta5 of mid and hind-leg which are brown.

Head (Fig. 15 A). AR 1.91. Ultimate flagellomere 639 µm long. Temporal setae 7 including 2 inner verticals, 4 outer verticals, and 1 postorbitals. Clypeus with 16 setae. Tentorium 109 µm long, 18 µm wide at sieve pore and 2 µm wide at posterior tentorial pit. Stipes 118 µm long. Palpomere lengths (in µm) : 23, 36, 83, 98, 160. Fifth / third palpomere 1.92. Third palpomere with 2 sensilla clavata.

Thorax (Fig. 15 B). Acrostichals 10, dorsocentrals 7, prealars 3. Scutellum with 4 setae.

Wing (Fig. 15 C). VR 1.14. Brachiolum with 1 seta, R with 12, R₁ with 7, R₄₊₅ with 4 setae, M bare. Squama with 4 setae.

Legs. Scale on front tibia (Fig 15 D) 37 µm long including apical spine. Spurs on middle tibia (Fig 15 E) 39 µm long, on hind tibia (Fig 15 F) 47 µm long. Comb on middle tibia 12 µm long, long and short comb on hind tibia 16 µm and 14 µm long respectively. Width at apex of front tibia 42 µm, of middle tibia 40 µm, of hind tibia 46 µm. Lengths (in mm) and proportions of legs :

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₄	LR	BV	SV
p ₁	723	441	-	-	-	-	-	-	-	-
p ₂	708	609	363	182	128	93	45	0.60	3.44	3.63
p ₃	751	680	513	256	214	123	57	0.75	3.00	2.79

Hypopygium (Fig. 15 G-I). Tergite IX with 5 median setae, altogether 10 posterior setae to each side of anal point. Laterosternite IX with 2 setae. Anal point 56 µm long, 62 µm wide at base, gradually tapering to nearly parallel-sided towards 4 µm wide apex. Transverse sternapodeme 11 µm long, phallapodeme 56 µm long. Gonocoxite 60 µm long. Total length of superior volsella including apicomedial projection 53 µm ; apicomedial projection 33 µm long ; base with 3 inner and 1 apical setae, microtrichiae present on dorsal surface. Inferior volsella 88 µm long, laterally broadened subapically and with prominent apical seta. Gonostylus 75 µm long. HR 0.80.

Remarks. - The shape of the superior volsella and abdomen coloration and coloration pattern is different from other species within the subgenus.

Distribution. - Known from Sudan.

***Polypedilum (Uresipedilum) praegnans* sp. n.**

(Figs. 17 A-D)

Polypedilum (Polypedilum) annulatum Freeman 1958 : 295 pro parte

nec Polypedilum (Polypedilum) annulatum Freeman 1954 : 22.

Type locality. - SENEGAL : Dakar.

Type material. - Holotype 1 ♂, here designated, SENEGAL : Dakar II-III. 1960, M. Emerit (BMNH). Paratypes : EGYPT : Wadi el Natrum, in grass of a spring, 2 ♂, IX 1954, E. J. Fittkau (ZSM). ZAIRE ; Lumbubashi, Elisabethville 1 ♂, 15. XII. 1938, H. J. Bredo (BMNH, 12.204).

Diagnostic characters. - Differs from other members of the subgenus in the bulging shape of the superior volsella with a very short apicomedial projection.

Etymology. - From Latin, *praegnans*, with child, referring to the bulging shape of the superior volsella resembling a pregnant woman.

Male imago

(n= 3-4 except when otherwise stated).

Total length 2.65-3.21 mm. Wing length 1.20-1.58, 1.37 mm. Total length/ wing length 2.17-2.24. Wing length/ length of profemur 1.87-1.98.

Coloration. Thorax almost completely brown as in Fig. 3 A, abdomen with dark brown bands as in Fig. 4 D. Femur, tibia and tarsi pale yellow.

Head. AR 1.56-1.66. Ultimate flagellomere 473-613 μ m long. Temporal setae 10-11 including 2-3 inner verticals, 4-5 outer verticals, and 3 postorbitals. Clypeus with 12-16 setae. Tentorium 133 μ m (1) long, 22 μ m (1) wide at sieve pore, 4 μ m (1) wide at posterior

tentorial pit. Stipes 89 μ m (1) long. Palpomere lengths (in μ m) : 24-49, 36-53, 86-91, 78-83. Fifth palpomere lost. Third palpomere with 3 sensilla clavata.

Thorax. Acrostichals 12 (2), dorsocentrals 9-11, prealars 3-4. Scutellum with 4-5 setae.

Wing. VR 1.19-1.27, 1.22. Brachiolum with 1 seta ; R with 9-18, 14 ; R₁ with 8-12,10 ; R₄₊₅ with 10-20 setae, M bare. Squama with 5-7, 6 setae.

Legs. Scale on front tibia 41-47 μ m long including 11-14 μ m long apical spine. Spurs on middle tibia 47-54 μ m long including comb, on hind tibia 49-56 μ m long including comb. Comb on middle tibia 22-30 μ m long, long and short comb on hind tibia 13-19 μ m and 18-23 μ m long respectively. Width at apex of front tibia 41-44 μ m, of middle tibia 39-58 μ m, of hind tibia 44-53 μ m. Lengths (in mm, n=2-3) and proportions of legs :

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅
p ₁	605-737	378-482	-	-	-	-	-
p ₂	643-765	520-633	312-387	170-198	128-151	85-95	47-52
p ₃	671-813	643-709	449-539	227-265	189-217	113-132	47-66

	LR	BV	SV	BR
P ₁	-	-	-	-
P ₂	0.57-0.61	4.60-4.65	3.61-4.00	3.3-5.0
P ₃	0.70-0.76	2.96-3.03	2.82-2.93	5.1-5.7

Hypopygium (Fig. 17 A-D). Tergite IX with 4-12 median setae, altogether 10-16 posterior setae to each side of anal point. Laterosternite IX with 5-6 setae. Anal point 56-71, 64 μ m long ; 27-45, 38 μ m wide at base ; gradually tapering to nearly parallel-sided towards 4 μ m wide apex. Transverse sternapodeme 11-27, 20 μ m wide ; phallapodeme 75-101, 84 μ m long. Gonocoxite 128-165 μ m long. Total length of superior volsella including apicomedial projection 56-95, 76 μ m ; apicomedial projection 9-22, 16 μ m long ; base with no inner and 3-4 apical setae, microtrichiae present on dorsal surface. Inferior volsella 94-124, 111 μ m long ; laterally broadened subapically, with prominent apical seta. Gonostylus 131-173, 155 μ m long. HR 0.97-0.98, HV 1.90-2.02.

Remarks. - The superior volsella has a heel similar to that of *P. (U.) harrisoni*, but the species can be separated from the latter by the bulging shape of the superior volsella similar to *P. (U.) canum* from New Zealand. The superior volsella lacks inner setae.

Distribution. - The species is known from Senegal, Egypt and Zaire.

***Polypedilum (Uresipedilum) harrisoni* sp. n.**

(Figs. 3 D, 16)

Polypedilum (Polypedilum) annulatum Harrison, 1996 : 78 nec Freeman, 1954.

Type locality. - GHANA : Greater Accra Region, University of Ghana, Legon, Botanical garden Vaughan pond.

Type material. - Holotype ♂, here designated, Legon, Botanical garden Vaughan pond, 3-6. II. 1993, NUFU project (ZMBN Type No. 273). Paratypes : SUDAN, Yirol, 6 ♂, XII. 1954, (BMNH).

Diagnostic characters. - Differs from other members of the subgenus in heel-like shape of superior volsella.

Etymology. - This species is named after Dr. A. D. Harrison, Fish Hoek, South Africa.

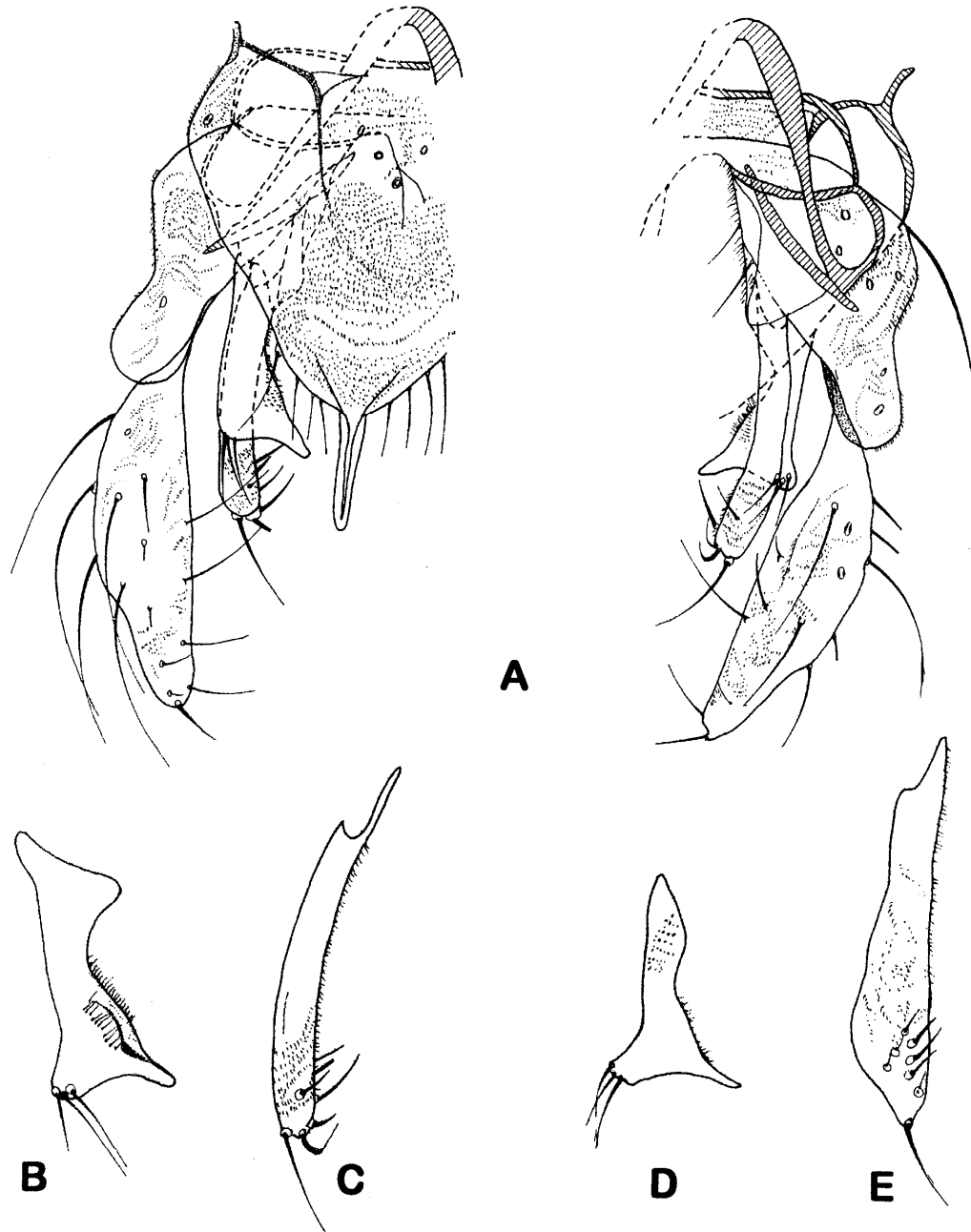


Fig. 16. *P. (U.) harrisoni* sp. n., male imago : A. Hypopygium ; B. Superior volsella ; C. Inferior volsella ; D, E. Variation of volsellae.
Fig. 16. *P. (U.) harrisoni* n. sp. imago mâle. A. Hypopyge ; B. Volsella supérieure ; C. Volsella inférieure ; D, E. Variations des volsellae.

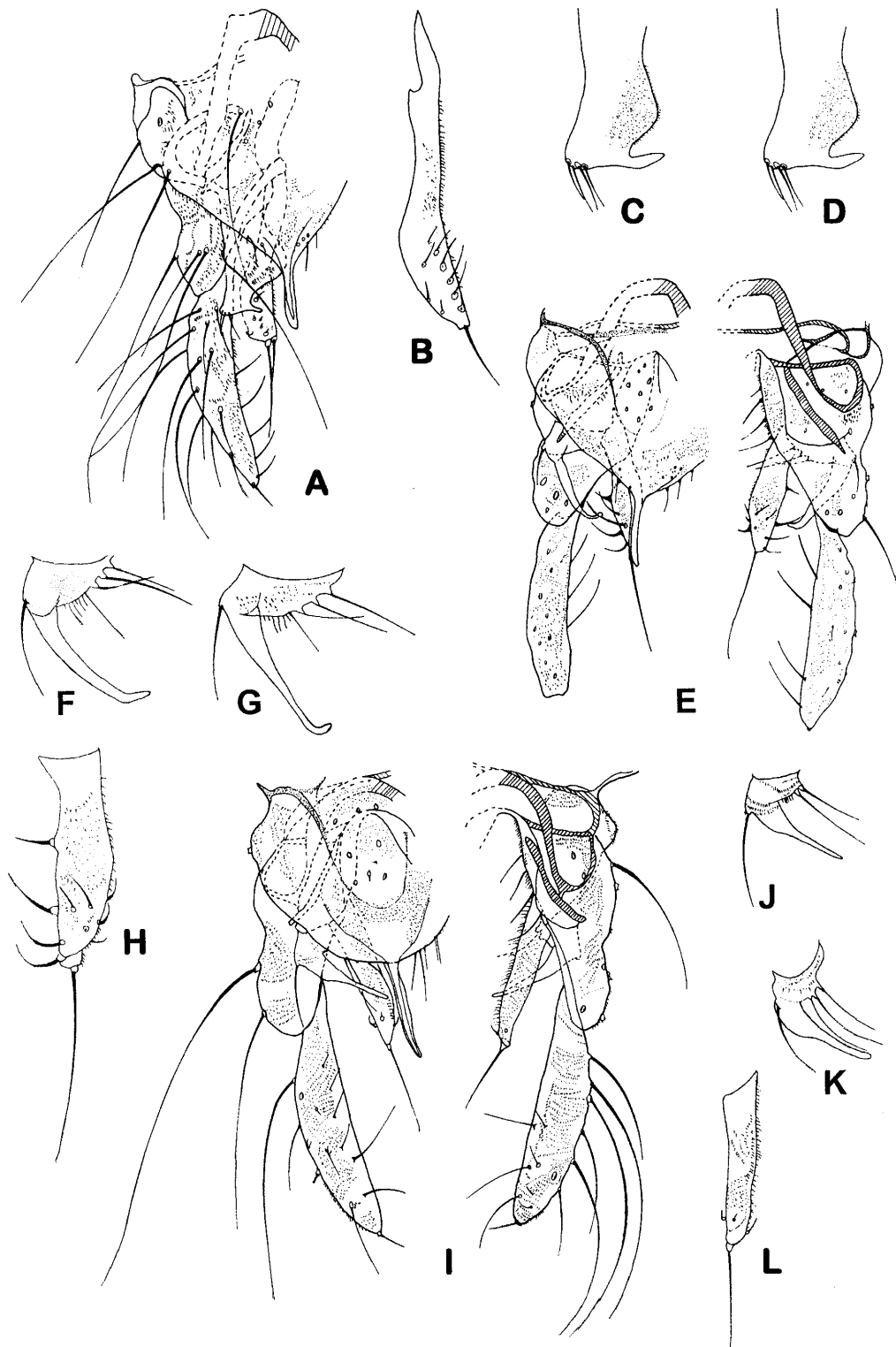


Fig. 17. *Polypedilum (Uresipedilum)* spp., male imago : A-D. *P. (U.) praegnans* sp. n. : A. Hypopygium ; B. Inferior volsella ; C, D. Superior volsella variation. E-H. *P. (s. str.) ephippium* Freeman : E. Hypopygium ; F, G. Superior volsella ; H. Inferior volsella ; I-L. *P. (s. str.) anderseni* sp. n. : I. Hypopygium ; J, K. Superior volsella ; L. Inferior volsella.

Fig. 17. *Polypedilum (Uresipedilum)* spp., imago mâle : A-D *P. (U.) praegnans* n. sp. : A. Hypopyge ; B. Volsella inférieure ; C, D. Volsella supérieure, variation. E-H. *P. (s. str.) ephippium* Freeman : E. Hypopyge ; F, G. Volsella supérieure ; H. Volsella inférieure ; I-L. *P. (s. str.) anderseni* n. sp. : I. Hypopygium ; J-K. Volsella supérieure ; L. Volsella inférieure.

Male imago

(n= 6-7, except when otherwise stated).

Total length 2.54-3.32, 3.10 (5) mm. Wing length 1.27-1.52, 1.41 mm. Total length/ wing length 1.85-2.23, 2.09 (5). Wing length/ length of profemur 2.04-2.32, 2.15.

Coloration. Thorax (Fig. 3 D) almost completely brown and abdomen brown with dark brown bands as in Fig. 4 D. Femur, tibia and tarsi pale yellow.

Head. AR 1.72-1.82 (3). Ultimate flagellomere 528-635 (3) μ m long. Temporal setae 5-9, 7 ; including 2-3, 2 inner verticals ; 3-4, 3 outer verticals ; and 1-2, 2 (5) postorbitals. Clypeus with 10-22, 16 setae. Tentorium 91-95, 94 μ m long ; 18-26, 23 μ m wide at sieve pore ; 3-7, 5 μ m wide at posterior tentorial pit. Stipes 111-144, 124 μ m long. Palpomere lengths (in μ m) : 22-33,

28 ; 32-44, 38 ; 71-95, 85 ; 98-111, 102 ; 138-167, 149 (5). Fifth / third palpomere 1.47-1.97, 1.76 (5). Third palpomere with 2 sensilla clavata.

Thorax. Acrostichals 14-16, 14 ; dorsocentrals 7-10, 9 ; prealars 3-5, 4. Scutellum with 4-7, 5 setae.

Wing. VR 1.15-1.25, 1.20. Brachiolum with 1 seta ; R with 15-17, 15 ; R₁ with 7-10, 9 ; R₄₊₅ with 9-15, 12 setae ; M bare. Squama with 5-9, 6 setae.

Legs. Scale on front tibia 29-44, 36 μ m long, sharply pointed. Spurs on middle tibia 44-56, 49 (5) μ m long ; on hind tibia 44-64, 59 μ m long. Comb on middle tibia 13-20, 16 μ m long ; long and short comb on hind tibia 14-24, 19 μ m and 9-17 μ m long respectively. Width at apex of front tibia 38-42, 44 μ m ; of middle tibia 38-56, 46 μ m ; of hind tibia 40-56, 50 μ m. Lengths (in mm) and proportions of legs (n= 1-3 on ta₁-ta₅) :

	fe	ti	ta ₁	ta ₂	ta ₃	
P ₁	605-756, 692	370-477, 430	730	452	320	
P ₂	623-716, 671 (5)	513-609, 578	292-347	155-180	122-132	
P ₃	641-813, 749	406-694, 653	402-559	214-256	178-217	
	ta ₄	ta ₅	LR	BV	SV	BR
P ₁	249	107	1.86	1.53	1.37	3.8
P ₂	71-75	36-43	0.57-0.59	3.75-3.82	3.63-3.89	3.4-3.6
P ₃	103-121	41-57	0.73-1.01	2.91-3.11	2.56-2.92	4.0-6.1

Hypopygium (Fig. 16 A-E). Tergite IX with 4-6, 5 median setae ; altogether 10-14, 13 posterior setae to each side of anal point. Laterosternite IX with 1-4, 2 setae. Anal point 53-69, 61 μ m long ; 24-47, 40 μ m wide at base, gradually tapering to nearly parallel-sided towards 2-4, 4 μ m wide apex. Transverse sternapodeme 16-27, 23 (6) μ m long ; phallapodeme 60-82, 70 μ m long. Gonocoxite 122-153, 142 (2) μ m long. Total length of superior volsella including apicomedial projection 64-78, 70 μ m ; apicomedial projection 11-20, 15 μ m long ; base with no inner and 3 apical setae, microtrichiae present on dorsal surface. Inferior volsella 100-129, 118 μ m long ; laterally broadened subapically or parallel sided and with prominent apical seta. Gonostylus 124-175, 158 μ m long. HR 0.75-1.00, 0.92 ; HV 1.91-2.18, 2.03.

Remarks. - The superior volsella has a heel similar to that *P. (U.) praegnans* but has no bulging shape. The superior volsella bears no inner setae. The species is regarded as identical to the species described as *P. (P.) annulatum* by Harrison (1996), but in the present specimen the heel is more pronounced.

Distribution. - Known from Ghana and Sudan.

5. *Polypedilum* subgenus *Polypedilum*

The following two species, *P. ehippium* Freeman and a very similar species from Ghana, *P. anderseni* apparently belong to the nominal subgenus and not to *Uresipedilum*. They are described here as another of the paratypes of *P. ehippium*, does belong to the subgenus *Uresipedilum*, appear to be the one drawn by Freeman, and is redescribed above as *P. (U.) freemani* sp. n. The colour pattern of these species are very similar and probably led to the misidentification by Freeman.

Polypedilum (Polypedilum) ehippium Freeman

(Figs. 4 B, 17 E-L)

Polypedilum (Polypedilum) ehippium Freeman, 1958 : 292, pro parte.

Material examined. - ZIMBABWE : Harare, paratypes of *Polypedilum ehippium*, all data as holotype, 3 ♂, IV. 1956, E. T. M. Reid (BMNH, B. M. 1956-288).

Diagnostic characters. - The species can be separated from the other Afrotropical species of the nominal subgenus by lacking spots on the wings and frontal tubercles, and by having a dark thorax and an abdomen with segments I-V yellow with median half of III dark.

Male imago

(n= 2-3, except when otherwise stated).

Total length 3.56 (1) mm. Wing length 1.78-1.91 mm. Total length/ wing length 1.88 (1). Wing length/ length of profemur 2.06-2.10.

Coloration. Thorax almost completely dark brown as in Fig. 3 A, and abdomen with segments I, II, IV and V pale, segment III partly dark brown (Fig. 4 B). Femur, tibia and tarsi yellow.

Head. Antennae lost. Temporal setae 7-8 including 2-3 inner verticals, 4 outer verticals, and 1 postorbitals. Clypeus with 11-15 setae. Tentorium 122-125 μ m long, 23-26 μ m wide at sieve pore, 4-7 μ m wide at posterior tentorial pit. Stipes 109-155 μ m long. Palpomere lengths (in μ m) : 27-40, 40 (1), 133-140, 122-131, 282 (1). Fifth / third palpomere 2.12 (1). Third palpomere with 2 sensilla clavata.

Thorax. Acrostichals 14-16, dorsocentrals 6-8, prealars 3. Scutellum with 4-6 setae.

Wing. VR 1.18-1.19. Brachiolum with 1 seta, R with 14-20, R₁ with 11-12, R₄₊₅ with 14-23 setae, M bare. Squama with 3-5 setae.

Legs. Scale on front tibia 40-53 μ m long including apical spine. Spurs on middle tibia 49-62 μ m long, on hind tibia 58-73 μ m long. Comb on middle tibia 20-22 μ m long, long and short comb on hind tibia 20-22 μ m and 18-20 μ m long respectively. Width at apex of front tibia 44-51 μ m, of middle tibia 49-53 μ m, of hind tibia 56 μ m. Lengths (in mm) and proportions of legs :

	fe	ti	ta ₁	SV
p ₁	860-933	548-687	-	-
p ₂	869-929	737-801	459 (1)	3.62 (1)
p ₃	940-997	869-918	-	-

Hypopygium (Fig. 17 E-H). Tergite IX with 6-7 median setae, altogether 12-16 posterior setae to each side of anal point. Laterosternite IX with 2-3 setae. Anal point 111-118 μ m long, 58-69 μ m wide at base, gradually tapering to nearly parallel-sided towards 4-7 μ m wide apex. Transverse sternapodeme 27-36 μ m long, phallapodeme 84-89 μ m long. Gonocoxite 162-171 μ m long. Total length of superior volsella including apicomedial projection 87-122 μ m ; apicomedial projection 75-77 μ m long ; base with 4 inner and 1 api-

cal setae, microtrichiae present on dorsal surface and base. Inferior volsella 98-118 μ m long, parallel sided, with prominent apical seta. Gonostylus 173-193 μ m long. HR 0.89-0.94, HV 1.88 (1).

Remarks. - This species has a peculiar attachment of apicomedial projection which is similar to *P. (P.) anderseni*, but it can be distinguished from the latter in abdomen coloration pattern, also the superior volsella has 4 inner setae.

Distribution. - The species is known from Zimbabwe.

***Polypedilum (Polypedilum) anderseni* sp. n.**

(Figs. 3 F, 4 A, 17 J-L)

Type locality. - GHANA : Western Region, Ankasa Game Production Reserve.

Type material. - Holotype σ , here designated, GHANA : Western Region, Ankasa Game Production Reserve, 7-11. XII. 1993, NUFU project (ZMBN Type No. 278). Paratypes : 1 σ , as holotype (ZMBN) ; Volta Region, Wli, Agumatsa waterfalls, 1 σ , 17-20. XI. 1993, NUFU project (ZMBN).

Diagnostic characters. - The species can be separated from the Afrotropical species of the nominal subgenus by lacking spots on the wings and frontal tubercles, and by having dark thorax and an abdomen with segments I-V yellow with anterior third of segment I and IV and a small anterior spot on segment III dark. The apicolateral seta of the superior volsella is placed at the apex of the base and not on the projection.

Etymology. - Named after Associate Professor Trond Andersen, Museum of Zoology, University of Bergen, one of the supervisors for the M. phil. thesis of E. A. O., and for commenting on the preliminary MS.

Male imago

(n= 2-3, except when otherwise stated).

Total length 2.40-2.62 mm. Wing length 1.14-1.19 mm. Total length/ wing length 2.08-2.27. Wing length/ length of profemur 1.88-2.00.

Coloration. Thorax almost completely dark brown except for part of the preepisternum (Fig 3 F). Abdomen with segment I partly dark brown, II pale, III and IV with dark brown anterior triangular spots (Fig. 4 A). About two thirds of foreleg femur brown, rest of femur, tibia, tarsi, midleg and hindleg yellowish brown or bright yellow.

Head. AR 1.59-1.73. Ultimate flagellomere 484-543 μ m long. Temporal setae 7-9 including 2-3 inner verticals, 2-4 outer verticals, and 2-3 postorbitals. Clypeus with 11-13 setae. Tentorium 67-78 μ m long, 14-22 μ m wide at sieve pore and 3-6 μ m wide at posterior tento-

rial pit. Stipes 89-104 µm long. Palpomere lengths (in µm) : 24-27, 22-28, 49-83, 83-89, 118-131. Fifth / third palpomere 1.57-2.41. Third palpomere with 3 sensilla clavata.

Thorax. Acrostichals 18-20, dorsocentrals 7, prealars 3. Scutellum with 5-6 setae.

Wing. VR 1.14-1.21. Brachiolum with 1 seta, R with 4-6, R₁ with 0, R₄₊₅ with 1-4, setae, M bare. Squama with 4-5 setae.

Legs. Scale on front tibia 30-47 µm long including apical spine. Spurs on middle tibia 23-34 µm long, on hind tibia 44-47 µm long. Comb on middle tibia 7-11 µm long, long and short comb on hind tibia 16-27 µm 10-11 µm long respectively. Width at apex of front tibia 22-36 µm, of middle tibia 33-38 µm, of hind tibia 38-42 µm. Lengths (in mm) and proportions of legs :

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄
p1	587-637	320-345	673-724	424-477	320-342	253-267
p2	598-634	431-491	267-285	114-135	85-100	52-61
p3	655-708	534-580	402-417	217-231	178-203	101-117
	ta ₅	LR	BV	SV	BR	
p1	103 (1)	2.10	1.44 (1)	1.34-1.35	2.9-4.1	
p2	25-32	0.58-0.62	4.22-4.70	3.81-3.99	2.4-3.8	
p3	39-45	0.69-0.78	2.84-3.00	2.87-3.20	6.6-6.7	

Hypopygium (Fig. 17 J-L). Tergite IX with 6-8 median setae, altogether 10-12 posterior setae to each side of anal point. Laterosternite IX with 2-3 setae. Anal point 78-84 µm long, 49-58 µm wide at base, gradually tapering to nearly parallel-sided towards 2-4 µm wide apex. Transverse sternapodeme 18-20 µm long, phallapodeme 53-59 µm long. Gonocoxite 113-122 µm long. Total length of superior volsella including apicomedial projection 52-58 µm ; apicomedial projection 22-42 µm long ; base with 2-3 inner and 1 apical setae, microtrichiae present on dorsal surface and base. Inferior volsella 84-89 µm long, parallel-sided and with prominent apical seta. Gonostylus 129-133 µm long. HR 0.88-0.92, HV 1.84-2.05.

Remarks. - This species is similar to *P. (P.) ephippium* Freeman, but can be distinguished by the coloration pattern of the thorax and abdomen. *P. (P.) anderseni* has no setae on R₁, and R₄₊₅ and R have less than 5 and 7 setae respectively.

Distribution. - The species is found in rivers in the Ankasa Game Production Reserve and at the Agumatsa waterfalls, Ghana.

6. Zoogeography

The subgenus *Uresipedilum* is cosmopolitan with species present in all zoogeographical regions. Parsimony analyses of all known species within the subge-

nus consistently gave three major groups, while two additional smaller groups and single species were variably placed. In the cladograms regarded as the most likely the five groups are clear, as are the separate placement of three single species (Fig. 2A). The majority rule tree differs from the strict tree only by having better resolution within the *convictum* group. The majority rule tree forms the base for the area cladogram shown in Fig. 18. However, only the relationships between species with known immatures (Fig. 2 B) can be regarded as being reasonably well established. Only the *convictum* and the *oresitrophum* groups have more than one species with known immatures.

P. (U.) tamasemusi from Japan apparently form the sister group of the remaining species. In some parsimony analyses, however, the species is included in the *oresitrophum* group.

The *pseudoconvictum* group consists of the Afrotropical *P. (U.) dossenuidum* described here, *P. (U.) pseudoconvictum* known from Peru and *P. (U.) pedatum* found in Japan, USA and widespread in Canada. The group is rather weakly delimited. *P. (U.) dossenuidum* is rather similar to *P. (U.) tesfayi* and in some parsimony runs it falls in the *kibatiense* group. However, if the group is assumed correct the relationships appear to reflect the separation of Brazil from West Africa approximately 100 million years ago with subsequent dispersal over the Isthmian passage formed about 65

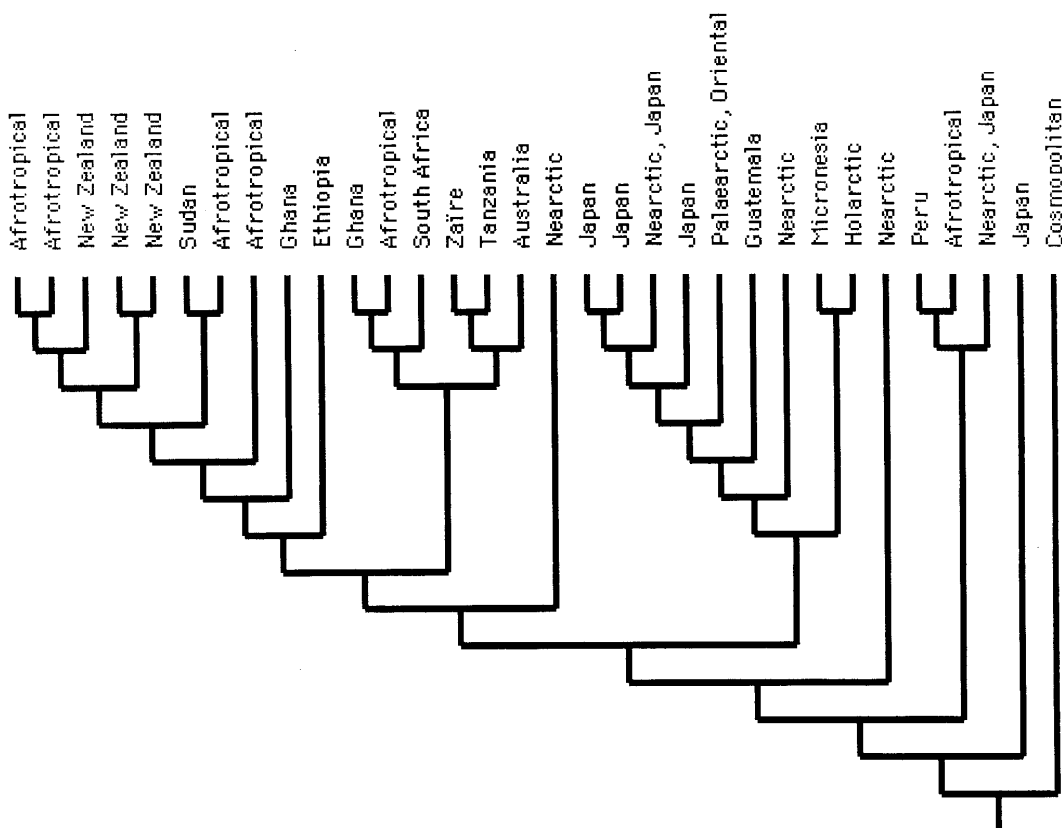


Fig. 18. Area cladogram based on Fig. 2 A. The cosmopolitan group to the right represents *Polypedilum* subgen. *Tripodura*, other *Polypedilum* plus *Phaenopsectra*.

Fig. 18. Cladogramme des régions d'après la Fig. 2. A. Le groupe cosmopolite sur la droite représente *Polypedilum* subgen. *Tripodura*, d'autres *Polypedilum* plus *Phaenopsectra*.

million years ago between North America and South America into eastern Palaeartic over North America.

The *cultellatum* group consists of one species from Micronesia together with one Holarctic species. However, both included species varies considerably in placement between different analyses.

The *convictum* group consists of Palaeartic and Nearctic species and appear to be a Laurasian lineage. However, most of the Palaeartic species are limited to Japan and the lineage may be relatively young. A possible dispersal route for the Eastern Asian and North American lineages may be through the northern Bering Strait during the Quaternary Ice Age where there was a broad landbridge. Since the Palaeartic and Oriental *P. (U.) convictum*, and the Japanese *P. (U.) paraviceps*, *P. (U.) hirosshimaense* and *P. (U.) surugense* on one hand, and the Nearctic species *P. (U.) flavum*, *P. (U.) aviceps* on the other are very closely

related, it is likely that the last group dispersed relatively recently during the Quaternary Ice Age to North America. Normally, the eastern North America lineages are much better represented on the Gulf slope of Central Mexico, which has never been sharply isolated from that of the USA (Banarescu, 1995). This then explains the presence of the *convictum* group from Guatemala.

The *oresitrophum* group consists of Afrotropical species with one Australian species. The Australian species in several other trees form the sister group of the remaining species. It appears likely that this is an old lineage corresponding to the earliest divisions of Gondwanaland.

The *kibatiense* group consists of Afrotropical species together with three species from New Zealand. Making the species from New Zealand one monophyletic group does not increase the number of unweigh-

ted steps and the *kibatiense* group could be rooted at the stem of the New Zealandian species. Taken in combination with the *oresitrophum* group a possible scenario is that both groups existed on the pre-drift Gondwanaland in the early Cretaceous. Both groups were in Africa. However, the *oresitrophum* group was represented in Australia but not on the part becoming New Zealand, while the opposite was the case for the *kibatiense* group.

Although the above zoogeographical analysis is tentative and preliminary, it generally confirms the findings of the phylogenetic analysis and indicates that the subgenus predates the earliest split of Gondwanaland in the early Cretaceous.

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