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Authors: Sinclair, Bradley J., and Shamshev, Igor V.

Source: African Invertebrates, 53(1) : 239-248

Published By: KwaZulu-Natal Museum

URL: https://doi.org/10.5733/afin.053.0116

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African Invertebrates Vol. 53 (1) Pages 239–248 Pietermaritzburg June, 2012

Afropeza, a new South African genus (Diptera: Empidoidea: Brachystomatidae), with description of three new species

Bradley J. Sinclair[1] and **Igor V. Shamshev**[2]

[1]Canadian National Collection of Insects & Ottawa Plant Laboratory – Entomology, CFIA, K.W. Neatby Bldg., C.E.F., 960 Carling Avenue, Ottawa, ON, K1A 0C6 Canada; bradley.sinclair@inspection.gc.ca
[2]All-Russian Institute of Plant Protection, shosse Podbel'skogo 3, St Petersburg – Pushkin, 188620 Russia; shamshev@mail.ru

ABSTRACT

Afropeza gen. n. is described to include three new species (*A. pappi* sp. n., *A. silvatica* sp. n., and *A. stuckenbergi* sp. n.) from South Africa. This is the third brachystomatid genus known from Africa and its phylogenetic relationships within the subfamily Trichopezinae are discussed.

KEY WORDS: Brachystomatidae, Empidoidea, identification key, new genus, new species, South Africa.

INTRODUCTION

The current knowledge and taxonomic status of the Afrotropical Empidoidea (exclusive of Dolichopodidae) is due almost entirely to the comprehensive revision of the southern African Empididae *sensu lato* by K.G.V. Smith (1969). That revision was based primarily on the collections of Brian Stuckenberg (housed in the KwaZulu-Natal Museum, South Africa) and the Natural History Museum, London, United Kingdom. More recent works expanded upon this baseline, adding new species and a few new genera or generic records (*e.g.*, Wagner & Andersen 1995; Sinclair 1996, 1999, 2002; Daugeron 2000, 2001; Daugeron & Grootaert 2003; Shamshev & Grootaert 2009, 2010).

In the Afrotropical Region, all five families of the Empidoidea are known (Sinclair & Cumming 2006), including Atelestidae represented by the recently discovered genus *Alavesia* Waters & Arillo, 1999 (Sinclair & Kirk-Spriggs 2010). The Brachystomatidae are represented by *Rubistella* Garrett Jones, 1940, *Apalocnemis* Philippi, 1865 (based on a single specimen) (Sinclair 2003) and the new genus described in this paper. There are now eight empidoid genera (exclusive of Dolichopodidae *sensu lato*) classified as endemic to southern Africa (Sinclair 2003).

It is a great honour to include this paper in the Gedenkschrift celebrating the life of Brian Stuckenberg. The first author met Brian for the first time in 1994 during a visit to the then Natal Museum. He was a most generous man and provided great insights into the southern African fauna. BJS's publications on southern African empidoids benefited greatly from Brian's annotations on biogeography and collecting habitats. His dedication to the KwaZulu-Natal Museum collection and visiting scientists was outstanding.

MATERIAL AND METHODS

This study is based on material loaned from or deposited in the following institutions:

CNC	Canadian National Collection of Insects, Ottawa, Canada;
HNHM	Hungarian Natural History Museum, Budapest, Hungary;
MZLU	Museum of Zoology, Lund University, Lund, Sweden;
NMSA	KwaZulu-Natal Museum, Pietermaritzburg, South Africa;
ZFMK	Zoologisches Forschungsmuseum Alexander Koenig, Bonn, Germany.

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Terminology used for adult structures primarily follows that of McAlpine (1981), except for antennae and wing venation where the terms of Stuckenberg (1999) and Saigusa (2006) were used, respectively. Saigusa (2006) homologised the dipteran vein A_1 (McAlpine 1981) with *CuP* of Mecoptera. Consequently, the following wing venation terms are used here: CuA_1 (of McAlpine) = M_4, CuA_2 = *CuA*, anal cell = cell *cua*, and anal vein (A_1+CuA_2) = *CuP*+*CuA*. Homologies of male terminalia follow Sinclair and Cumming (2006).

Label data for primary types are presented exactly as they appear. Data are listed from the top downward on the staging pin, with data from each label enclosed in quotation marks; lines are delimited by a forward slash mark. Additional information is included in square brackets. The repository of each type is given in parentheses. Secondary type data are abridged and listed alphabetically.

TAXONOMY

Genus **Afropeza** gen. n.

Etymology: The genus is named in reference to the restriction of this genus to Africa. The Greek word *peza* (foot) is a common suffix applied to genera of Empidoidea. Feminine gender.

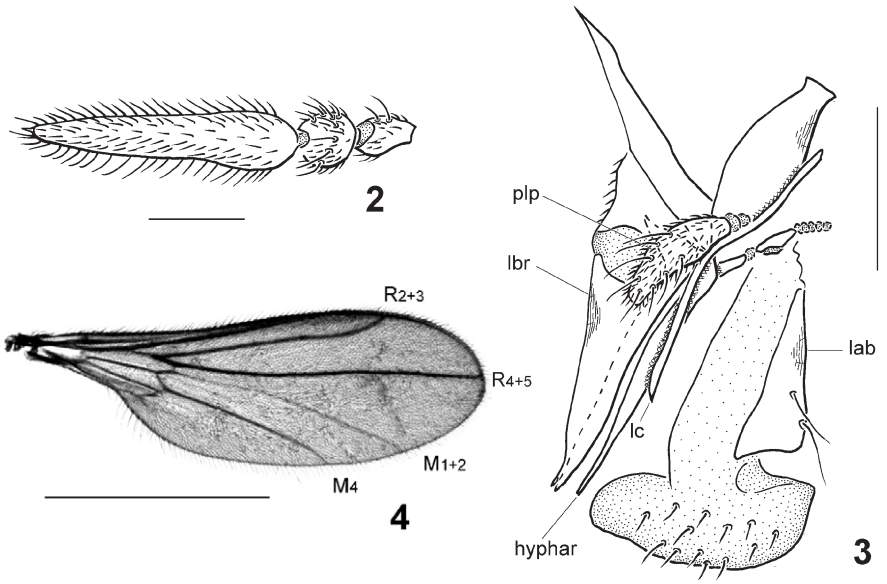
Type species: *Afropeza silvatica* sp. n.

Diagnosis: The genus (as in Fig. 1) is readily identified by eyes closely approximate on frons in both sexes; postpedicel normally elongate, strap-shaped with short stylus; discal cell absent; M_{1+2} vein unbranched, greatly weakened, especially sub-basally; wing membrane with dense microtrichia; apex of female abdomen truncate, bearing acanthophorites.



Fig. 1. Habitus photograph of *Afropeza pappi* sp. n. Scale bar = 1.0 mm.

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Figs 2–4. (2, 3) *Afropeza silvatica* sp. n.: (2) antenna, lateral view; (3) mouthparts, lateral view; (4) *Afropeza pappi* sp. n., wing. Abbreviations: hyphar – hypopharynx, lab – labium, lbr – labrum, lc – lacinia, *M* – medial vein, plp – palpus, *R* – radial vein. Scale bars: Figs 2, 3 = 0.1 mm; Fig. 4 = 0.5 mm.

Description:

Male.

Head: Eyes closely approximated on frons, with V-shaped notch opposite antennal base; facets enlarged on frons compared to posterolaterally; eyes bare (ommatrichia absent). Face widely separated, as wide as antennae at sockets. Ocellar setae shorter or indistinguishable from 1 or 2 pairs of frontal and postocellar setae; upper postocular seta(e) long, overlapping eye. Antenna inserted at middle of eye height; scape and pedicel subequal in length; scape bearing short dorsal setulae; pedicel with circlet of subapical setulae; postpedicel normally elongate, strap-shaped with short stylus (as in Fig. 2). Proboscis (as in Fig. 3) shorter than half length of eye height. Palpus straight, short; bearing numerous setulae, held parallel to proboscis; lacinia slender, straight, shorter than hypopharynx. Labrum slender, straight with pair of apical epipharyngeal blades; epipharyngeal carina short, present on proximal margin. Hypopharynx straight, slender, subequal in length to labrum; salivary pump small. Labellum well developed with approx. 10 pairs of pseudotracheae.

Thorax: Acrostichal and dorsocentral setae uniserial anteriorly, acrostichals biserial on prescutellar depression; numerous postpronotal setae; notopleural setae slender; pair of stout lower supra-alar setae above wing base. Precoxal bridge present; dorsal mesepimeron pocket present; laterotergite bare.

Legs: Lacking modified setae and processes; fore tibia with anteroventral comb reduced; hind tibia with well developed posteroventral apical comb. Tarsomere 5 unmodified, truncate apically, bearing short claws and pad-like pulvilli; empodium with pubescent ventral face.

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Wing (as in Fig. 4): Length 1.8–2.5 mm. Slender, anal lobe only slightly developed, widely obtuse. Membrane thickly clothed in long microtrichia; base of cell *br* bare, lacking microtrichia; wing margin with long setulae; basal costal seta absent; pterostigma present at apex of R_1. Costa strongly reduced beyond R_{4+5}; *Sc* reduced beyond *Rs* branching, weakly extended to *C*; R_{4+5} unbranched terminating near wing apex; discal cell absent; M_{1+2} unbranched, greatly weakened, more pronounced at *r–m* crossvein; M_4 complete, weakened at wing margin; apex of cell *cua* (*CuA* vein) slightly sinuous, recurved, base of cell *cua* closely associated with wing margin; anal vein short and abruptly ending.

Abdomen: Tergites well developed, bearing scattered slender setae; tergite 8 very slender medially, strap-like, heavily sclerotised, symmetrical or asymmetrical. Sternites weakly sclerotised proximally, sternite 8 heavily sclerotised, larger than preceding sternites, symmetrical or asymmetrical.

Male terminalia: Symmetrical and upright to slightly asymmetrical and rotated 45° to right. Epandrial lamellae separate; surstylus with singular or paired lobes. Hypandrium well developed; gonocoxal apodemes broad, well developed; postgonite arising from posterolateral margin of hypandrium, closely associated with phallus. Ejaculatory apodeme large, arched dorsally.

Female. Similar to male, except eye facets not as enlarged anterodorsally compared to posterolaterally. Sternite 7 narrowed anterodorsally, arched dorsally to tergite 7; tergite 7 with sparse fringe of apical setae. Female terminalia (as in Fig. 9): Tergite 8 with stout median rod-like apodeme extending into segment 7. Tergite 8 heavily sclerotised along anterior margin, deeply U-shaped posterodorsally, with arms extending beyond margin of tergite 10; sternite 8 rod-shaped, heavily sclerotised, articulated with tergite 8 anteriorly. Tergite 10 bearing 5 pairs of spine-like acanthophorite setae. Cercus heavily sclerotised, somewhat arched dorsally; bearing several spine-like setae. Spermatheca spherical, darkly sclerotised; spermathecal duct slender, extending into segment 6.

Remarks: This genus is assigned to the subfamily Trichopezinae on the basis of the presence of an internal apodeme arising from the anterior margin of the female tergite 8, in addition to female tergite and sternite 8 articulated anteroventrally, female cercus heavily sclerotised and female tergite 7 with fringe of setae along posterior margin (as in Fig. 9).

The phylogenetic relationships of this genus within the Trichopezinae remain uncertain. No other genus in this subfamily has eyes closely approximated on the frons in both sexes. The elongate postpedicel with long pubescence is similar to that found in *Niphogenia* Melander, 1928 and *Ceratempis* Melander, 1928 (Sinclair 2008), but both male and female terminalia of the last two mentioned genera are distinctly different. Further work is needed to resolve the phylogenetic relationships of the genera of the Trichopezinae.

A female specimen in very poor condition is possibly congeneric and represents an undescribed species (South Africa, Western Cape, 7 km E Ladismith, 33°31'00"S 21°19'51"E, 520 m, 1–23.x.2004, M.E. Irwin, F.D. Parker, M. Hauser, Malaise trap in sandy wash (DNA Voucher 'Eden', extracted 8.v.2008, I.S. Winkler; CNC). The specimen differs in having the postpedicel elongate and tapered with a slender stylus subequal to length of the postpedicel and in having cell *cua* broader apically. An associated male is required to confirm the identity of this species and assess its generic assignment.

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Key to species of the genus *Afropeza* gen. n.

1 Males 2
– Females 4

2 Male terminalia with epandrial lamellae rounded and expanded laterally, genital capsule rotated 45° to right and overlapping abdomen (Fig. 10). Surstyli and sclerites of segment 8 asymmetrical ..... **stuckenbergi** sp. n.
– Male terminalia with epandrial lamellae not expanded laterally, genital capsule upright at apex of abdomen, not rotated and overlapping abdomen (Figs 5, 7). Surstyli and sclerites of segment 8 symmetrical 3

3 Surstylus divided into pair of lobes; posterior lobe expanded apically from narrow base with finger-like lobe on inner face (Fig. 7). Epandrium rounded with anterodorsal lobe bearing pair of setae (Figs 7, 8). Cerci cone-shaped with numerous setae (Fig. 7). Tergite 8 slender, only slightly expanded on lateral margins ..... **silvatica** sp. n.
– Surstylus undivided, inner posterior face with ribbed surface (Fig. 5). Epandrium narrow and elongate, lacking anterodorsal lobe. Cerci fused into stout U-shaped process, bearing pair of spine-like apical setae (Fig. 6). Tergite 8 slender, greatly expanded on lateral margins..... **pappi** sp. n.

4 Postpedicel longer than width of eye ..... **stuckenbergi** sp. n.
– Postpedicel shorter than width of eye 5

5 Pleura dusted with pruinescence. Length of postpedicel 0.8× width of eye ..... **pappi** sp. n.
– Pleura largely shiny, mostly lacking pruinescence. Length of postpedicel 0.6× width of eye ..... **silvatica** sp. n.

Afropeza pappi sp. n.

Figs 1, 4–6

Etymology: This specific name is a patronym in honour of Dr Laszlo Papp, who kindly sent the senior author the first series and drawings of this new species.

Diagnosis: This species is characterised by the length of the postpedicel being 0.8× width of eye; pleura clothed in pruinescence; male terminalia symmetrical with stout, U-shaped cerci bearing pair of spine-like apical setae, inner margin of surstyli with ribbed inner posterior surface.

Description:

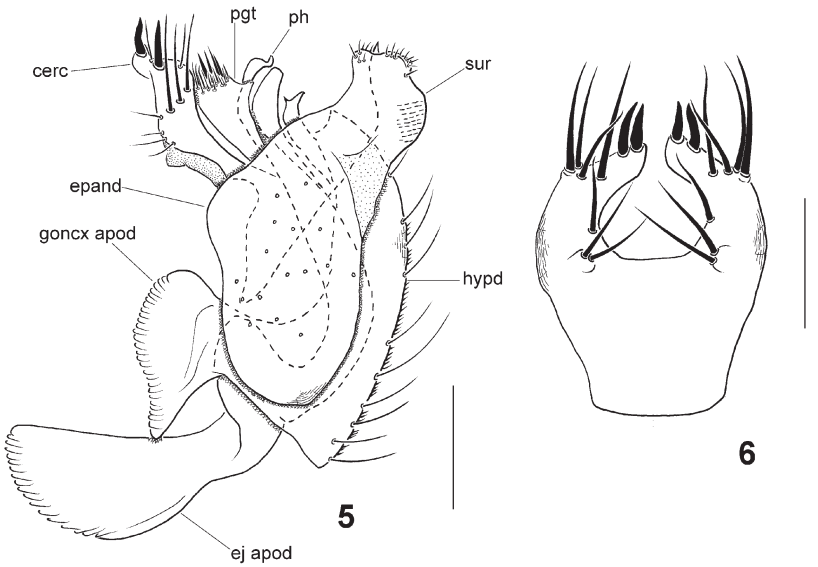
Male.

Head: Antenna with postpedicel 0.8× width of eye (in lateral view); stylus comprising only spine-like apical mechanoreceptor.

Thorax: Pruinescent lateral band extending from postpronotal lobe to postalar callus; scutellum and anterior margin of scutum between postpronotal lobes clothed in pruinescence; pleura normally thinly clothed in pruinescence. Acrostichal setae on prescutellar depression biserial, erect and directed anteriorly.

Legs: Mostly pale yellow, except base of fore coxa darkened; tarsi gradually darkening towards apex.

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Figs 5, 6. *Afropeza pappi* sp. n., male terminalia: (5) lateral view; (6) cerci, anterior view. Abbreviations: cerc – cercus, ej apod – ejaculatory apodeme, epand – epandrium, goncx apod – gonocoxal apodeme, hypd – hypandrium, pgt – postgonite, ph – phallus, sur – surstylus. Scale bars = 0.1 mm.

Wing (Fig. 4): Length 2–2.5 mm. Haltere knob and distal half of stem dark; proximal half of stem pale yellow.

Abdomen: Ventral setae pale, dorsal setae dark; tergite 8 narrowed medially, widely expanded towards lateral margin, symmetrical, lacking setation; sternite symmetrical. Male terminalia (Figs 5, 6): Symmetrical, held erect at apex of abdomen, strongly U-shaped in posterior view. Cerci heavily sclerotised, fused together to form U-shaped process (resembling subgenus *Planempis* Frey, 1953 of Empididae), bearing pair of spine-like apical setae and 2 or 3 long lateral setae. Epandrium elongate and slender, dorsally directed. Surstylus comprising single lobe, with inner posterior subapical surface ribbed; inner apex with pair of hook-like processes, anterior processes sharply pointed. Hypandrium with uniquely beak-shaped gonocoxal apodeme, expanded dorsally and sharply attenuated ventrally; hypandrium slender, arched, terminating in pair of hook-like processes. Postgonite closely approximated with phallus; apex with crown of setulae and stout setae. Phallus arched and attenuated apically to narrow posterodorsally directed tube-like opening; ejaculatory apodeme enlarged and prolonged in horizontal plane, more than half length of phallus.

Female. Similar to male, except abdominal setae paler, especially toward posterior segments.

Holotype: ♂ "S.AFR:KZN:Royal Natal / Nat.Res., Gudu Forest / 1680–1730 m; MT / 28°40.90'S 28°55.78'E / 22.ix.–17.xi.2006 / M. Mostovski leg." (NMSA).

Paratypes: SOUTH AFRICA: *KwaZulu-Natal*: 3♂ 8♀ same data as holotype (2♂ 7♀ NMSA, 1♂ 1♀ CNC); 1♀ same as holotype, except 13.xii.2005–28.i.2006 (NMSA); 1♂ 1♀ same as holotype, except 29.i–28.v.2006 (NMSA); 3♂ 7♀ same as holotype, except 18.xi.2006–27.ii.2007 (NMSA); 2♂ N Drakensberg, along iMpofane River, 29°03'12.7"S 29°23'06.2"E, 1531 m, 29.i.2007, L. Papp & M. Földvári, No. 42 (HNHM); 1♂ Majuba Area, 27°28.6'S 29°49.1'E, 1700 m, 29.i.1998, S. James, indigenous forest nr Majuba (NMSA).

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Afropeza silvatica sp. n.

Figs 2, 3, 7–9

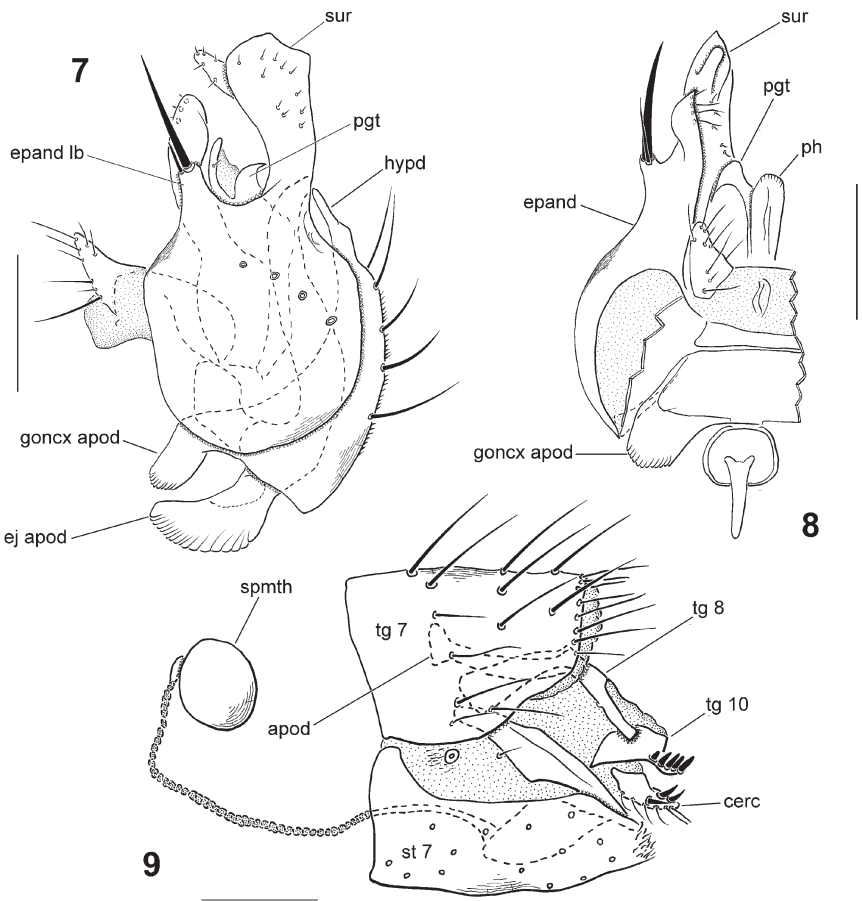
Etymology: From Latin *silvaticus*, *-a*, *-um* (of woods), in reference to Gudu Forest, where the species was primarily collected.

Diagnosis: This species is characterised by the length of the postpedicel being 0.6× width of eye; pleura mostly lacking pruinescence; male terminalia symmetrical, held upright with pair of surstylar lobes and anterodorsal epandrial lobe bearing pair of setae.

Description:

Male.

Head: Antenna (Fig. 2) with postpedicel *ca* 0.6× width of eye; stylus comprising only spine-like apical mechanoreceptor.



Figs 7–9. *Afropeza silvatica* sp. n., terminalia: (7) male, lateral view; (8) male, anterior view; (9) female, lateral view. Abbreviations: apod – apodeme, cerc – cercus, ej apod – ejaculatory apodeme, epand lb – epandrial lobe, epand – epandrium, goncx apod – gonocoxal apodeme, hypd – hypandrium, pgt – postgonite, ph – phallus, spmth – spermatheca, st – sternite, sur – surstylus, tg – tergite. Scale bars = 0.1 mm.

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Thorax: Scutum mostly shiny, except thin clothing of pruinescence on postalar callus and scutellum; anterior margin of scutum shiny, lacking pruinescence; pleura mostly lacking pruinescence. Acrostichal setae on prescutellar depression biserial, erect and anteriorly directed.

Legs: Mostly pale yellow, except base of fore coxa darkened; tarsi gradually darkening towards apex.

Wing: Length 2–2.5 mm. Haltere knob and distal half of stem dark, proximal half of stem pale yellow.

Abdomen: Setae mostly dark, except for anterior sternites; tergite 8 very narrow, except slightly expanded at lateral margin, symmetrical, lacking setation; sternite symmetrical. Male terminalia (Figs 7–9): Symmetrical, held erect at apex of abdomen. Cercus heavily sclerotised, cone-shaped, with numerous long setae along anterior margin. Epandrium rounded, with oblique row of stout setae; epandrial lobe on anterodorsal margin with pair of stout setae of different lengths, longer seta projecting beyond posterior surstylar lobe. Surstylus comprising pair of lobes; anterior lobe flattened, slightly curved posteriorly, with 3 or 4 fine setae on inner surface; posterior lobe expanded apically, with narrow, tapered obliquely projecting finger-like process. Hypandrium narrow, arched, with apex produced into pair of divergent projections, with gonocoxal apodeme shorter than ejaculatory apodeme, parallel-sided. Postgonite closely approximated with phallus; apex terminating into pair of sickle-shaped prolongations. Phallus arched and projecting posteriorly with tube-like opening between forked apex of hypandrium; ejaculatory apodeme enlarged ventrally and prolonged in horizontal plane, approximately twice length of gonocoxal apodeme.

Female. Similar to male, except abdominal setae paler, especially toward posterior segments.

Holotype: ♂ "S.AFR:KZN:Royal Natal / Nat.Res., Gudu Forest / 1680–1730 m; MT / 28°40.90'S 28°55.78'E / 13.xii.2005–28.i.2006 / M. Mostovski leg." (NMSA).

Paratypes: SOUTH AFRICA: *KwaZulu-Natal*: 11♂ 21♀ same data as holotype (10♂ 20♀ NMSA, 1♂ 1♀ CNC); 4♂ same as holotype, except 18.xi.2006–27.ii.2007 (NMSA); 2♀ same as holotype, except 29.i–28.v.2006 (NMSA).

Afropeza stuckenbergi sp. n.

Fig. 10

Etymology: This specific name is a patronym in honour of our esteemed colleague, mentor, and KwaZulu-Natal Museum dipterist, Dr Brian Stuckenberg, who collected the first specimen of this new genus.

Diagnosis: This species is characterised by the length of the postpedicel longer than width of eye; pleura clothed in pruinescence; males with an enlarged genital capsule rotated approx. 45° to the right and asymmetrical surstyli.

Description:

Male.

Head: Antenna with postpedicel slightly longer than width of eye; stylus comprising only spine-like apical mechanoreceptor.

Thorax: Scutum mostly shiny, except thin clothing of pruinescence on notopleuron, postalar callus and scutellum; anterior margin of scutum mostly shiny, except anterior

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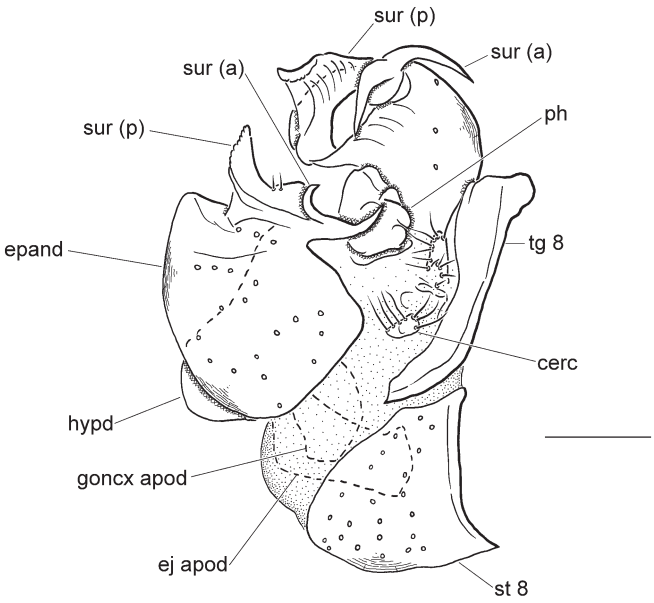


Fig. 10. *Afropeza stuckenbergi* sp. n., male terminalia, dorsolateral view. Abbreviations: cerc – cercus, ej apod – ejaculatory apodeme, epand – epandrium, goncx apod – gonocoxal apodeme, hypd – hypandrium, ph – phallus, st – sternite, sur (a) – anterior surstylus, sur (p) – posterior surstylus, tg – tergite. Scale bar = 0.1 mm.

face of postpronotal lobe; pleura mostly with pruinescence. Acrostichal setae on prescutellar depression biserial, erect and directed anteriorly.

Legs: Mostly pale yellow; tarsi gradually darkening towards apex.

Wing: Length 1.8–2.0 mm. Haltere knob and distal half of stem dark; proximal half of stem pale yellow.

Abdomen: Ventral setae pale, dorsal setae dark; tergite 8 asymmetrical, subrectangular, with darkly pigmented and thickened anterior margin, expanded on right lateral end; posterior margin unpigmented; sternite 8 asymmetrical, slightly prolonged on left lateral margin, closely associated with right edge of tergite 8. Male terminalia (Fig. 10): Asymmetrical, rotated approx. 45° to the right. Cercus well sclerotised, cone-shaped, with numerous long setae along margins. Epandrium rounded, inflated laterally. Surstyli asymmetrical comprising pair of lobes; anterior lobe comprising pair of sharply pointed divergent processes; posterior process directly medially; right anterior process more strongly curved apically. Posterior surstylar lobe flattened, convoluted, ridge-like. Hypandrium greatly expanded ventrally, strongly tapered and arched apically; gonocoxal apodeme fan-shaped, broader than ejaculatory apodeme. Postgonite closely approximated with phallus; apex expanded into ventral shelf-like phallic guide. Phallus arched anteriorly, projecting through epandrial lamellae; apex bearing pair of rounded lobes; ejaculatory apodeme enlarged, greatly expanded apically and prolonged in horizontal plane, approximately half length of phallus.

Female. Similar to male, except abdominal setae paler, especially toward posterior segments.

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Remarks: This species is presently known primarily from the Western Cape Province in humid to dry forests. Most paratypes were swept from grass vegetation in open roadside areas in a rather dense, dry forest (Danielssen pers. comm. 2011).

Holotype: ♂ "Südafrika, Cape Pr., / Diepwalle Forest [33°57'S 23°10'E] / NE Knysna / 5.XI.1991 H. Ulrich" (NMSA).

Paratypes: SOUTH AFRICA: *Eastern Cape*: 1♀ Port Elizabeth District, Van Staadens Pass [33°54'S 25°12'E], 30.x.1964, B. & P. Stuckenberg (NMSA). *Western Cape*: 1♂ 2♀ Tsitsikama N.P., Stormsriver Pass, 33°59'S 23°55'E, 19.x.1994, loc. 26, R. Danielsson (MZLU).

ACKNOWLEDGMENTS

We are indebted to the following curators and their respective institutions for the loan of specimens: L. Papp (HNHM), R. Danielsson (MZLU), M. Mostovski (NMSA), N. Dorchin (formerly ZFMK). Issac Winkler (North Carolina State University) kindly provided an additional specimen from a survey of South Africa. Adrian Plant and Patrick Grootaert kindly reviewed the manuscript.

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