Zootaxa 4486 (4): 535–547
http://www.mapress.com/j/zt/

Article

ISSN 1175-5326 (print edition)
ZOOTAXA
ISSN 1175-5334 (online edition)

https://doi.org/10.11646/zootaxa.4486.4.7
http://zoobank.org/urn:lsid:zoobank.org:pub:9503B15D-3126-43E4-BDA0-E66465227BC8

Kribiodorum Kieffer (= *Stelechomyia* Reiss) (Diptera: Chironomidae) extends into the Oriental region: three new species and expanded diagnoses

PETER S. CRANSTON
Evolution & Ecology, Research School of Biology, Australian National University, Canberra, A.C.T. 2601, Australia.
E-mail: pscranston@gmail.com
urn:lsid:zoobank.org:author:C068AC61-DF1D-432A-9AB7–52B5D85C6C79

Abstract

Kribiodorum Kieffer, an otherwise North American and African genus of Chironomini (Diptera: Chironomidae), extends to the Oriental region through two new species. An adult male and female of *Kribiodorum malicky* **sp. n.** is newly described from Thailand, and from Brunei (Borneo) a pharate male and the pupa of *Kribiodorum belalong* **sp. n.** is described. Additionally, from Namibia (s.w. Africa) a 'manuscript' taxon is described formally with co-authorship of the late Arthur Harrison as *Kribiodorum kunene* **sp. n.** Males of the new species and the sole new pupa conform substantially to generic diagnoses based on the North American *Kribiodorum perpulchrum* (Mitchell). Examination of specimens of African *Kribiodorum pulchrum* Kieffer and N. American *K. perpulchrum* confirms their morphological similarity and reaffirms the junior synonymy of *Stelechomyia* Reiss designated for the North American species. *Kribiodorum* expands the number of genera of Chironomidae with African and Asian representatives, although unusual in its absence from Australia yet presence in the Nearctic.

Key words: New species, Asia, Africa, range extension

Introduction

Described originally as a monotypic genus in the subfamily Chironominae, *Kribiodorum* Kieffer, 1921 was erected for *Kribiodorum pulchrum* Kieffer, 1921, from adults from Kribi in Cameroon, West Africa. Type material of *K. pulchrum* is not extant and our understanding derives from Freeman (1958), who placed the species in *Lauterborniella* Thienemann & Bause. Freeman cautioned that it, and the other 3 species that he placed there were 'probably not at all closely allied to one another' (Freeman, 1958: p. 320). This view has been confirmed, notably by Reiss (1990). Furthermore, Freeman stated that *K. pulchrum* resembled the North American *Chironomus perpulcher* (Mitchell 1908) considered by Johannsen (1937) and Townes (1945) to belong to *Lauterborniella*. Based on this North American species, Reiss (1982) proposed a new monotypic genus, *Stelechomyia*, for *perpulcher* (as *perpulchra*). In the 'Holarctic keys' (Pinder & Reiss 1983, 1986; Cranston *et al*. 1989) each life stage diagnosis was based on Reiss's (1982) review. Subsequently Reiss (1990: 144) assigned the African *K. pulchrum* to *Stelechomyia*, thereby joining *perpulchra* with an unnoticed consequence being *Stelechomyia* became a subjective junior synonym of *Kribiodorum* due to the transfer of the type species of *Kribiodorum* (namely *pulchrum*). The synonymy has been accepted and implemented by Epler *et al*. (2013) and Ekrem *et al*. (2017).

A distinctive larva, recognised by Roback (1953) as Tendipedini sp. A from immersed wood in Savannah River, South Carolina, was associated subsequently with *K. perpulchrum* (Mitchell) through rearing by Art Borkent. Larvae of *Kribiodorum perpulchrum* are found in dead wood in flowing water in eastern and southern North America. The immature stages of African *K. pulchrum* remain unknown. The presence of a pupa and associated teneral male of an undescribed species from southeast Asia was noted by Cranston in an informal (unpublished) interactive key (http://chirokey.skullisland.info/genus/Kribiodorum/). Although few details were provided, the record was formalized in Epler *et al*. (2013). The collections of the ZSM included adults of another undescribed species of *Stelechomyia* / *Kribiodorum* from southeast Asia. Here *Kribiodorum* is reviewed,

Accepted by B. Rossaro: 27 Aug. 2018; published: 1 Oct. 2018

descriptions of two new species from the Oriental region and one from southern Africa are provided, diagnoses are expanded to include female adults for the first time, and previously described species evaluated.

Methods

Collections were made by kicking and netting including downstream from immersed woody debris (Brunei). Larvae have been sought by fragmenting immersed wood in various states of decay, but without success. No material suitable for molecular study has been obtained. Specimens were slide mounted in Euparal using standard procedures (Cranston 2000) in the case of the Brunei specimen with the adult partially dissected from its exuviae. Loaned slide mounted specimens had been made without prior clearing by the late F. Reiss (ZSM) and Arthur Harrison. One of several unmounted female specimens from ZSM was mounted in Hoyers to clear intransigent specimens from near 50 year storage in ethanol: others were variably overcleared and mounted in Euparal. Identifications and drawings were made using a compound microscope with phase contrast and Nomarski optics.

Morphology. Terminology follows Sæther (1980), Cranston (1995) and Cranston *et al*. (1989). The variable quality of much of the examined material (uncleared, tarsomeres missing, disorientated genitalia) causes some difficulties. Thus although Reiss (1982: 298) stated 'etwa 12 zweireihig stehende Acrostichalborsten' [about 12 acrostichal setae standing in two rows] for *K. perpulchrum*, in the reared male available this number cannot be confirmed in the lateral view, although some setal pits can be recognised in the absence of the seta itself. Setal pits of all other thoracic setae (dorsocentrals, prealars and scutellars) are clear, yet acrostichals remain very difficult to interpret for any specimen.

The disorientated (partially rotated) genitalia of *K. belalong* and *K. kunene* mean the anal point cannot be seen in true dorsal view. While it would be possible to remount from Euparal and Canada Balsam respectively, this is rejected for fear of damage to the pharate specimen in the former, and likely inability to reorientate the latter. The genitalia are drawn as viewed, and not 'corrected' for orientation (Figs 1M, 2A): the anal point can be inferred to be narrow and not spatulate as in well-orientated congeners. Disorientation and lack of clearing means that the internal apodeme structures are difficult to interpret, and are drawn (incompletely) only for *K. belalong* (Fig. 1M). For all males the transverse sternapodeme is similar to that of *K. belalong*, being broad and with developed antero-lateral projections.

Interpretation of genitalic lobes follows Pinho *et al*. (2013). Thus in *Kribiodorum* a basal setose swelling ('lobe') originating ventral to the superior volsella in a level between this and the inferior volsellae must be a median volsella and not a microtrichiose projection (Pinho *et al*., 2013). The superior volsella comprises a microtrichiose and setose base originating dorsal and distal to the median volsella, with a 'digitus' projecting posteriorly from the basal lobe. The shape and orientation of the digitus is species-specific, but is very hyaline and can be understood only with 1000X magnification and phase contrast (less so with Nomarski interference).

Measurements, unless otherwise stated, are in µm rounded to the nearest 5 µm except when measurement at maximum magnification (oil immersion, x1000) can provide accuracy to +/- 1 µm. Antennal flagellomere and leg segment ratios are provided when components are present.

Taxon and specimen sampling. With the discovery of range-extending new species from Asia (Borneo and Thailand) and Namibia, it was advisable to review the two species previously allocated to *Kribiodorum*. The type-species, *K. pulchrum* Kieffer had not been revisited since the redescription by Freeman (1958). Material of both sexes was loaned by ZSM. The type species of *Stelechomyia* Reiss, *perpulchrum* (Mitchell), was well described by Reiss in all stages—an associated larva, pupa, adult male also was borrowed from ZSM. The re-descriptions of these taxa in this paper do not purport to cover the morphological range of the two species, but do allow understanding of the diversity within the enlarged genus and especially review and drawing of the genitalia. No additional larvae have been viewed.

Abbreviations. *ac*, acrostichal setae (count); *AR*, Antennal Ratio, length of terminal flagellomere divided by combined length of preceding flagellomeres); *B.l.,* Body length (an approximation) in mm; *BV*, "Beinverhältnis": length Fe, Ti + Ta_1 / combined $Ta_{2–5}$; *Dc*, dorsocentral setae (count); *Fe*, Femur, $Fl_{1–12}$, antennal flagellomere lengths 1–12 combined (adult male); *Gcx*, gonocoxite length; *Gst*, gonostylus length; *Pe/♂*, reared adult male with associated pupal exuviae; LR_n, Leg Ratio = ta_1 length / ti length; *Mvo*, median volsella; *n*, number of specimens measured; $P_{1–3}$, Leg(s) (1 = fore, 2 = mid, 3 = hind leg); *Pa*, prealar setae (count); *Palp*, palpomere lengths; *P(e),*

Pupa (exuviae); *Prov.*, province (Thailand); *R.*, River; *R, R_1, R_{4+5},* respective setae (count) on wing veins R, R_1, R_{4+5}; *Scts*, scutellar setae (count); *SV*, "Schenkel-Schiene-Verhältnis" = combined length of femur and tibia / length of first tarsal segment; *Svo*, superior volsella; *Ta*, Tarsomere; *Ti,* Tibia; *TLX*, male tergite IX setae (count); V.R., vein ratio = length of Cu / length of M; *W.l.*, Wing length (arculus to apex) in mm.

Institutions: AMGS: Albany Museum, Grahamstown, Eastern Cape, South Africa; ANIC, Australian National Insect Collection, CSIRO, Canberra, Australia; ZSM, Zoologische Staatssammlung München, Munich, Germany

Taxonomic results

Kribiodorum Kieffer

Kribiodorum Kieffer, 1921: 270.
Stelechomyia Reiss, 1982: 294. Type-species *Chironomus perpulcher* Mitchell (orig.des.)
Included species: *Kribiodorum pulchrum* Kieffer, 1921; *Kribiodorum perpulchrum* (Mitchell, 1908); *Kribiodorum belalong* Cranston sp. n. Brunei, *Kribiodorum malicky* Cranston sp.n. Thailand and *Kribiodorum kunene* Cranston and Harrison sp. n. Namibia.

Generic diagnosis. Male as in Reiss (1982) and Cranston *et al*. (1989) extended and including the following:

Body length 2.6–5.5 mm, wing length 1.35–1.86 mm. Legs dark banded, wing iridescent, brown with variably interrupted transverse translucent patches (Fig. 1C–D).

Antenna. With 13 flagellomeres, A.R. 0.7–1.7.

Head. Eye bare with wedge-shaped or quadrate dorsomedial extension. Frontal tubercles absent. Palp 5–segmented, segment 2 almost globular, segment 3 with 0–2 sensilla not in pit.

Thorax. Antepronotal lobes narrowed dorsally and narrowly or more distinctly separated dorsomedially; scutum extended, overreaching antepronotum(Fig. 1A–B). Without tubercle. Acrostichals present but numbers uncertain (see comments), dorsocentrals uniserial, up to 12 including 1–2 in humeral position, 3–6 prealars, 3–7 scutellars.

Wing (Fig. 1C–D) iridescent, brown with pale patches. Membrane finely punctate, without macrosetae. Anal lobe slight. Costa non-extended, ending above M_{1+2}. R_1 and R_{4+5} well separated with R_{2+3} running between and ending midway between apices of R_1 and R_{4+5}. R_{4+5} terminating slightly proximal to wing apex. V.R. c. 1.2–1.3. Veins R, R_1 and R_{4+5} setose. Squama bare.

All legs with some darker pigmented bands, setae arising from these areas contrastingly darker than from pale cuticle. Fore-femur weakly to strongly dilate in distal 1/3, dark with dense dark setae. Variable patterns of dark and pale bands on all femora and tibiae (Fig. 1H–L), with some darkening on distal tarsomeres, perhaps faint or absent on short mid-leg tarsomeres. Fore-tibial apex with shallow rounded scale and long curved spur inserted subapically on scale (Fig. 1E, F), mid- and hind-tibial combs narrowly separated; shorter, higher comb with distinct spur, broader shallower comb without spur (Fig. 1G). LR_1 2.0. Pulvilli slender, short, not extending beyond apex of simple claw.

Abdomen with dense long setae.

Hypopygium (Figs. 1M, 2A–I) with strong anal tergite bands, extending near to base of anal point, not meeting, enclosing field of dense long setae. Anal tergite squared off posteriorly, bearing subterminal anal point varying from long slender and tapering to broad and distally curved downward, with lateral flanges. Superior volsella (Fig. 2E–I) comprising raised base with few long setae and distal digitus, either a hyaline lobe or narrower and tapering to point. Mediolateral, in ventral plane at base of superior volsella a pad bearing 4–5 long, medially-directed strong setae, represents a squat median volsella. Inferior volsella elongate, not fused to gonocoxite other than narrow base. Gonocoxite and gonostylus conventional, with microtrichia and long setae.

Female, based on 2 species only; as diagnosis above excepting dimorphism.

Head. Antenna with 6 flagellomeres (division between 1st and 2nd can be faint) with paired hyaline sensilla located opposite and subapical on flagellomeres 2–6; terminal flagellomere dark (Fig. 3A). Palp with very short segment 2, distally of increasing length; segment 3 subapically with short single, perhaps double small sensillum. Clypeals numerous and strong, few linear aligned verticals.

Thorax with small, dorsally fused antepronotal lobes; scutum narrowed anteriorly, extending beyond

antepronotum. Acrostichals not visible, few Dc (5–8) with anteriormost in humeral position; few prealars (2–4) and scutellars (2–3).

Wing (Fig. 2C) length 1.45–1.8mm, with dark pigment deeper and slightly more extensive than in male.

Legs as male, but the less dilate fore-femur all are depilate, thus length, strength and pigmentation of setae is not discernible. LR_1 2.4. Pulvilli slightly shorter than claw.

Genitalia (Fig. 3B, C, D). Notum long, thin, with short rami. Gonocoxapodemes gently curved not fused medially, each with apparent weak branch into gonapophysis VIII. Coxosternapodeme strongly sclerotized, weakly curved. Gonapophysis VIII (Fig. 3C) with elongate dorsomesal lobe, essentially continuous with inner contour of vagina, microtrichiose, hyaline apico-medially, and distinct ventrolateral lobe of similar size to dorsomesal lobe, lying lateral to, and separate to dorsomesal lobe, microtrichiose with many short simple medio-apically directed setae. Apodeme lobe not visible. Labia well developed, hyaline, without microtrichia. Gonocoxite IX small, not extended laterally. Tergite IX broad, densely setose, undivided. Postgenital plate not visible. Seminal capsule mid-brown, ovoid to near spherical, with weak neck; spermathecal duct straight, thick-walled, dilate prior to fusion at apparent common opening. Cerci large, quadrate.

Pupa as in Pinder & Reiss (1986)

Larva as in Pinder & Reiss (1983) and Epler *et al*. (2013)

Key to species of adult males of *Kribiodorum* Kieffer

1 Base of wing dark, cell m_{1+2} continuously dark from base to subapex; apex of cell cu pale to posterior margin (Fig. 1C) 2
- Base of wing pale, mid-cell m_{1+2} pale, apex of cell cu with dark patch to posterior wing margin (Fig. 1D) 4
2 Asian species. Superior volsella digitus hyaline and blunt-ended (Fig. 2B, G) . . . . . *Kribiodorum malicky*
- African species. Superior volsella digitus tapering to point or rounded 3
3. Fore-leg femur with apical dark band, mid-leg femur pale; (Fig. 1K). Anal point spatulate (Fig. 2D) . . . . . *Kribiodorum pulchrum*
- Fore-leg femur with dark with narrow median pale band, mid-leg femur dark basally (Fig. 1J). Anal point slender (Fig. 2A) . . . . . *Kribiodorum kunene*
4 North American. Larger species, wing length c. 2.5 mm. Fore-leg femur subapex strongly swollen; mid-leg femur with broad dark band, tibia nearly all dark (Fig. 1L). Anal point broadly spatulate (Fig. 2C) . . . . . *Kribiodorum perpulchrum*
- Asian. Smaller species, wing length c. 1 mm. Fore-leg femur slightly swollen; mid-leg femur and tibia pale (Fig. 1H). Anal point narrow (Fig. 1M) . . . . . *Kribiodorum belalong*

Descriptions

Kribiodorum belalong Cranston sp. n.

(Figs 1E, H, M, 3E–G)

urn:lsid:zoobank.org:act: 61FF4067-CA43-4B83-B5D9-39650A42568B

Material examined. Holotype P♂, BRUNEI DARUSSALAAM, Temburong District, Kuala Belalong Field Study Centre, Sungai Belalong, 04°33'N 115°09'E, -.viii.1995 (Cranston) (ANIC).

Description. Adult Male (n=1, teneral). Colour of body not available.

B.l. 2.9 mm, unexpanded W.l. 0.8 mm.

Head. Eyes extended dorsally by 5–6 facets, 5 (?) temporals largely obscured by eye pigment; Fl_{1-12} 400–405, Fl_{13} 450, A.R. 1.1. Apical flagellomere rounded with no strong apical seta. 18 densely packed clypeals. Palps (partly contracted) lengths of segments 2–5: 90, 105, 100; 125, with 1 sensillum subapical on segment 3.

Thorax. Antepronotal lobes narrow, tapering, slightly separated medially, over-reached by scutum. Thorax dorsally smoothly curved without any tubercle. Ac few, indeterminate, Dc 5 with anterior 1–2 in humeral position; Pa 4, Scts 3 in visible half (damaged, estimated as 5–6 total).

Wing (pharate, dissected) with 2 narrowly separated transverse bands of brown pigment, neither band reaching radial sector anteriorly and not reaching wing base or apex. Anal lobe near absent. R ending in costa relatively retracted (c 3/4 wing length), R_{2+3} ending midway between R_1 and R_{4+5}, R_{4+5} ends close to wing apex. Wing with long setae (most c. 50 long) on anterior veins: R with c. 20, R_1 with c.12 and R_{4+5} with 16+. Squama bare.

Legs (faint, teneral, partially unmeasurable)(Fig. 1H). Darker pigmentation subapical on femur and tibia of P_1 and P_3, of P_2 paler only with slight darkened apex of Ta_2. Fore-femur dilate apically and darkened with dense dark setae. Lengths: P_1 550, 400, 630, 400, 250, 280, 100; P_2 570, 440, 320, 110, 70, 45, 50; P_3 600, 610, 320, 240, 220, 190, 110. Ratios: LR_1 2.0, LR_2 0.76, LR_3 0.53; BV_1 1.5, BV_2 4.75, BV_3 2.0; SV_1 1.5, SV_2 3.16, SV_3 3.78. Pulvilli slender, not extending to apex of simple claw.

Abdominal tergites all densely beset with long (> 120 µm) setae.

Hypopygium (Fig. 1M). TIX with 15 tightly clustered median setae demarcated by weak anal tergite bands, and with 5–6 shorter setae towards posterior margin of tergite, lateral to anal point. Anal point distorted by compression, elongate (c 65 µm), narrow, 5 µm wide at base tapering slightly to pointed apex. Base of SVo (Fig. 2E) elevated bearing 5–7 setae, partly overlying base of curved, apically pointed, bare digitus with dorsal flange and medio-ventral scoop-shaped inner surface. MVo ventral to any part of SVo, pad bearing 5–6 strong, medially-directed strong setae, with bases more or less aligned. Inferior volsella an elongate microtrichiose lobe, bearing long setae dorsally only, without any differentiated apical seta. Gonocoxite squat, 75 long, microtrichiose laterally, with few long setae. Gonostylus narrow, 125 long, microtrichiose and setose on dorsal and ventral surfaces, distally tapered to rounded apex, apically with single more posteriorly-directed seta.

Pupa (n=1) length 3.2 mm. Exuviae pale yellow with antennal sheaths and apophyses slightly darkener.

Cephalothorax. Cephalic area smooth without tubercles, pale / hyaline frontal setae 100–110. Dorsal margin of base of antennal sheath with pointed dorso-medially directed projection. One dorsal, 1 lateral antepronotal (damaged, not measurable). Thorax weakly tuberculate in mid-scutum. Dorsocentral setae in 2 clusters, one median the other retracted posteriorly, each seta c. 25 long, but broken. Two precorneals 50–60 long. Thoracic horn (Fig. 3E) base oval 14 x 12 µm, horn appears 3-branched: anterior and median both c. 120–130 long, posterior branch mostly bare, tapering distally, 330 long; median branch may hide another convoluted branch, indicating 4 branches likely are present. All branches have few short hyaline spines, and many more small (2 µm maximum diameter) patches. Apparently lacking prealar tubercle.

Abdomen (Fig. 3F) [Interpretation difficult as setose pharate male remains largely within exuviae, and layout / orientation is suboptimal]. Tergite I bare or with weak antero-lateral fine spinule patches; Tergites II–IV with substantial quadrate blocks of spinules extending laterally to apophyses but not extending to pleurae, broader anteriorly than posteriorly but not separated into anterior stronger bands of larger spinules; pattern less extensive on T V and VII, narrowed in mid-segment; TVII and VIII bare except for small antero-lateral patches of fine spinules on VI. Tergite II with transverse row of 47 hooks extending 80–85% of tergite width. Conjunctives TIII–IV and IV–V with broad transverse band of 35 disorganised rows of anterior-directed spinules, remaining conjunctives bare. Pedes spurii B slight. Weak but distinct vortex on IV, absent on V and VI. Posterolateral 'comb' on VIII with 3–4 teeth with one larger than others (Fig. 3G). Abdominal setation difficult to interpret. (D and V setae in Fig. 3F derived from *K. perpulchra*). Small 'O' setae on tergites and sternites. I without L seta, II–IV with 3 non-taeniate L setae, V–VIII with 4 taeniate L setae (the side of insertion of setae not possible to distinguish, drawn as if ventral as is evident for VIII); without supernumerary L seta. Anal lobe with 26 uniserial setae, 1 dorsal seta. Genital sac of ♂ extended, tapering.

Adult female and **Larva** unknown.

Etymology. (Derivato nominis). From 'Belalong', the name of the river ('sungai') and international field research station located thereupon. To be treated as a noun in apposition.

***Kribiodorum malicky* Cranston sp. n.**

(Figs. 1I, 2B,G)

urn:lsid:zoobank.org:act: 39DE5E3E-F55F-4D5A-AD60-0E9BBEFB7A24

Material examined. Holotype ♂, THAILAND, 'Fluss bei Mae Ping, ca 10 km N Chiang Dau' [Chiang Mai Province], 17.viii.1991 (Malicky) (ZSM). Paratype 1♀, as holotype.

Description. **Male** (n=1, uncleared, tarsomeres variably missing). B.l. 2.6 mm, W.l. 1.35 mm.

Head. Fl_{1-12} 465, Fl_{13} 340, A.R. 0.7. 13 clypeals. Palps 2–5: 25, 115, 125; 130.

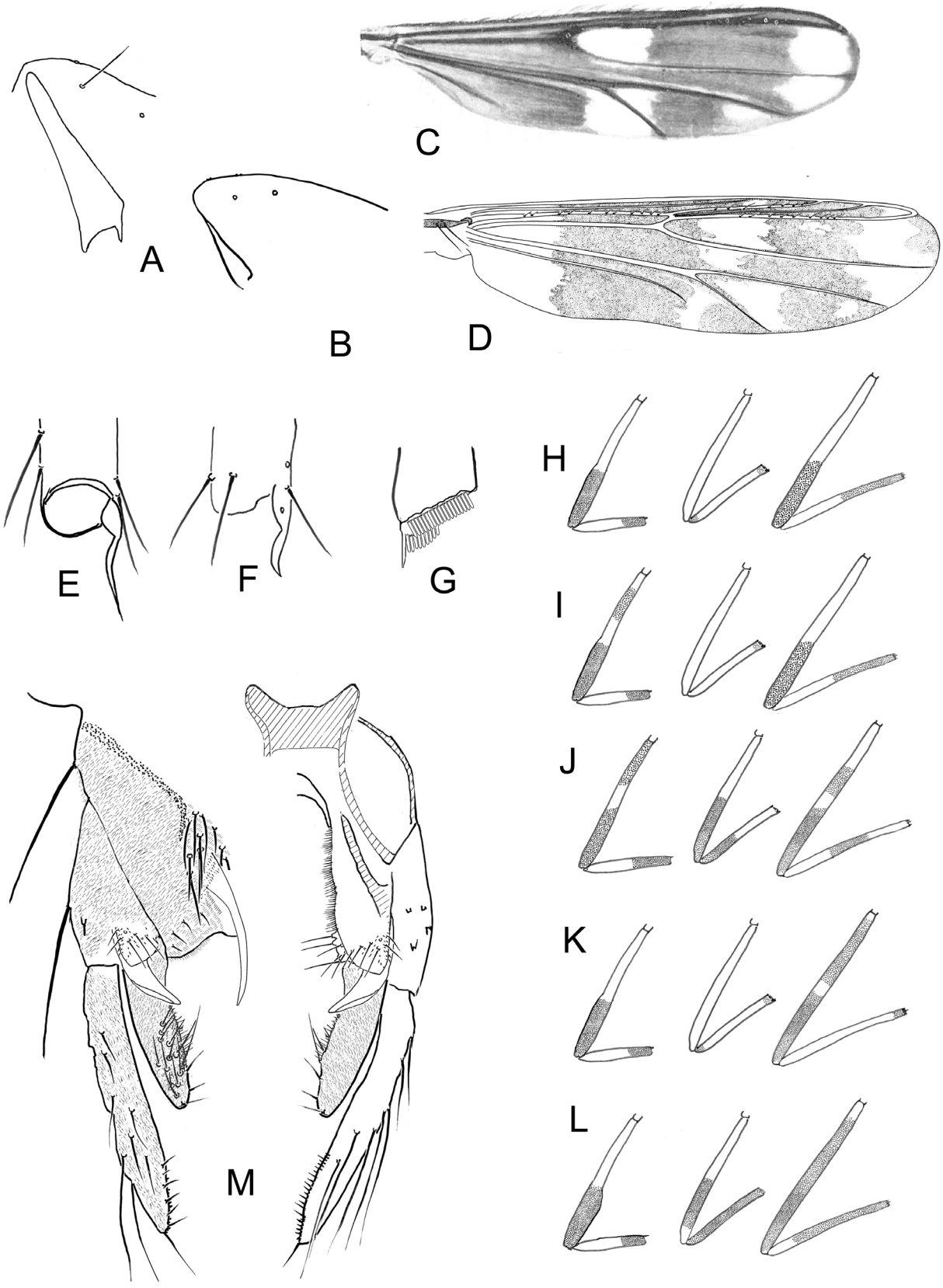

FIGURE 1. *Kribiodorum* spp., Adults. A, B. Lateral thorax, A, *K. perpulchrum;* B, *K. kunene*; C–D. wings, C. *K. pulchrum* female, D, *K. perpulchrum* male*;* E, Foretibial apex, spur, male *K. belalong*, F, foretibial apex, female *K. pulchrum*; G, hind-leg tibial comb, male, *K. pulchrum*; H–L, Fore- mid- and hind femora and tibia of: H, *K. belalong*, I, *K. malicky*, J, *K. kunene*, K, *K. pulchrum*, L, *K. perpulchrum*; M, Hypopygium *K. belalong,* Left side dorsal, Right side ventral/internal, stylised.

Thorax. Setation unidentifiable except for 3 Pa.

Wing extensively dark from brachiolum (as Fig 1C, *pulchrum*-type) with pale transverse bands across distal quarter of wing and mid-wing involving base of m3+4 and distal cu interrupted by continuous dark connecting through cell m1+2; vein setation: R with 10–11, R_1 with 9–10 and R_{4+5} with 12–14. V.R. 1.4.

Leg pigment apparently as in *K. pulchrum*, darker except Fe and Ti of P_2 pale; measurable lengths: P_1 365, 215, –; P_2 285, 180, 110, 50, 30, 16, 25; P_3 380, 290, 200, –. Calculable ratios: LR_2 0.61, BV_2 4.75, SV_2 4.7; SV_3 3.3.

Hypopygium (Fig. 2B) with 9–10 long TIX setae; anal point recurved, dilate apically, length and precise shape not measurable. Superior volsella (Fig. 2G) 30 long, hyaline lobe dorso-medially directed arising from broad, microtrichiose base. Base of sv dorsal-lateral to squat lobe bearing four 15 long setae arising from strong tubercles, identified here as a median volsella. Inferior volsella slender, gently curved inward, microtrichiose and with regular setae, none distinctly apical. Gonocoxite 82, swollen; gonostylus 107, medially broadened (likely dilate in lateral view) tapered distally.

Female (n=1, partially cleared)

B.l. 2.2 mm, W.l. 1.45 mm.

Head: Antennal 6 flagellomere lengths 52, 30, 50, 50, 50, 74, A.R. 0.32; with paired hyaline sensilla (25–30 long) opposite and subapical on 2–6; terminal flagellomere dark (Fig. 3A). Palp with segment lengths 180, 140, 115, 25. 15 clypeals, 4 aligned verticals.

Thorax as in male, Dc 5 with 1 in humeral position; Pa 3, Scts 2.

Wing pattern as male. V.R. 1.32. Vein setation: R with 13, R_1 with 12 and R_{4+5} with 14–6.

Legs as male except slightly dilate fore-femur is depilate, thus length, strength and pigmentation of distal setae not discernible. Leg lengths: P_1 400, 225, 540, 300, 200, 155, 80; P_2 290, 205, 165, 50, 30, 20, 17; P_3 465, 325, 248, 130, 120, 75, 45; Ratios: LR_1 2.4, LR_2 0.80, LR_3 0.75, BV_1 1.6, BV_2 5.6, BV_3 2.73, SV_1 1.16, SV_2 3.0, SV_3 3.26.

Genitalia (Fig. 3B–C). Notum long, thin, with short rami. Gonocoxapodemes gently curved not fused medially, each with apparent weak branch into gonapophysis VIII. Coxosternapodeme strongly sclerotized, weakly curved. Gonapophysis VIII (Fig. 2C) comprising elongate dorsomesal lobe, essentially continuous with inner contour of vagina, microtrichiose, hyaline apico-medially, and distinct ventrolateral lobe of similar size to dorsomesal lobe, lying lateral to, and separate to dorsomesal lobe, microtrichiose with many short simple medio-apically directed setae. Apodeme lobe not visible. Labia well developed, hyaline, without microtrichia. Gonocoxite IX small, not extended laterally. Tergite IX broad, densely setose, undivided. Postgenital plate not visible. Seminal capsule mid-brown, near spherical, 50um diameter, with weak neck; spermathecal duct straight, thick-walled, dilate prior to fusion at apparent common opening. Cerci large, quadrate, 85 long by 30 wide in dorsal view.

Larva and **Pupa** unknown.

Etymology. (Derivato nominis). In recognition of Hans Malicky, Austrian trichopterist, collector of many important Chironomidae from Thailand. To be treated as a noun in apposition.

Kribiodorum kunene Cranston and Harrison sp. n.

(Figs. 1B, J, 2A, F)

urn:lsid:zoobank.org:act: CF46D82C-E36E-423B-B687-0478A6083DBE

Material examined. Holotype ♂, slide mounted in Canada balsam by A. Harrison, NAMIBIA: Kunene, near Okandombo Guard Post, Cunene (sic) River, 17°02'00"S, 13°28'53"E (light trap, site #22), 27 xi 1998 (F. de Moor *et al*), coded as KUN. 136B (AMGS).

Description. **Male (**n=1 lacking all tarsomeres, hypopygium part-laterally mounted).

B.l. 3.4 mm. W.l. 1.5 mm.

Head. Antenna Fl_{1-12} 455, Fl_{13} 404, A.R. 0.89. 21 clypeals, 7 aligned verticals. Palpomeres (2–5) 25, 115, 165, 185.

Thorax. Antepronotal lobes narrow and meeting beneath extended scutum (Fig. 1B). Ac ?, Dc ?4 with 1 in humeral position; Pa 4, Scts 4.

Wing. Pattern as in Fig. 1B with dark base. V.R. 1.24. Vein setation: R with 19, R_1 with 18, R_{4+5} with 22 along full length of vein.

Legs with P_1 femora dark with short median pale section, distally slightly dilate subapically, tibia pale with

darkened apical 40%, P_2 femora dark in distal half, tibia dark in basal half, P_3 femora with short dark band in pale basal section, dark for apical 40%; all tarsomeres missing. Lengths: P_1 780, 480, –; P_2 760, 490, –; P_3 850, 700, –. Foretibial spine 40, slender, gently curved outward, scale at base microtrichiose.

Genitalia (Fig. 2A). TIX with cluster of 12 strong anal tergite setae just anterior to base of anal point; margin of TIX rounded (not squared off). Anal point appears parallel-sided, gently curved in lateral view, 64 long from origin on TIX. Superior volsella (Fig. 2F) with base difficult to discern, probably with 1–2 dorsal setae; digitus 37 long, curved, of even width to broad point. Base of mv well developed (according to orientation), 20 long and wide, with 4 or 5 simple setae up to 15 long. Inferior volsella (lying directly beneath gonostylus), 85 long, slender, with 5–6 long setae on inner subapical margin. Gcx 96, gently rounded, Gst 120, broadening distally then tapered to blunt point.

Female, **Pupa** and **Larva** unknown.

Etymology. (Derivato nominis). The specific epithet recognises the Kunene, river and region, of north-western Namibia, where the solitary specimen was collected by light trapping by Ferdy de Moor and his team. To be treated as a noun in apposition. Dual authorship recognises the late Arthur Harrison's description of this new species in an unpublished manuscript, from a slide he made from sorting extensive Kunene material.

Partial redescriptions

Kribiodorum pulchrum Kieffer, 1921

(Fig. 2D,I)

Kribiodorum pulchrum Kieffer, 1921: 46; Epler *et al*., 2013; Ekrem *et al*., 2018.
Lauterborniella pulchra (Kieffer); Freeman, 1958: 321.
Stelechomyia pulchra (Kieffer); Reiss, 1990: 300.

Material examined. 4♂, 4♀, Elfenbeinküste [IVORY COAST] leg. C. Déjoux (ZSM); 1♂, A.E. Sudan [SUDAN], Khartoum, 'at light' .x.1952 (D.J. Lewis) B.M. 1953–679 (ZSM); 1♂, Zaire [error: DEMOCRATIC REPUBLIC OF CONGO], Irangi, Fluß Luoho, 3–7.3.1984 (E.G. Burmeister).

Description. Male (n=2–6 variably badly preserved and/ or mounted; missing especially many leg parts.) Freeman 1958 in []).

B.l. 3.1–3.2, W.l. 1.6–1.86 mm [1.75–2.0].

Head: Antenna $Fl_{1–12}$ 420–500, Fl_{13} 550–575, A.R. 1.1–1.37 [about 1]. 23–30 clypeals, 5 aligned verticals. Palpomeres (2–5) 35–37, 110–125, 185–200, 175–200.

Thorax. Ac ? 7–9, Dc 8–9 with 1 in humeral position; Pa 2–3, Scts 4.

Wing. Pattern as in female. V.R. 1.25. Vein setation: R with 14–16, R_1 with 7–10, R_{4+5} with 16–18 in distal half only.

Legs with P_1 femur dilate, 2x width at apex compared to base, distal 1/3 dark with dark setae, tibia pale with darkened distal 1/4, $tarsomere_1$ distally dark, all other tarsomeres darkened. Lengths: P_1 850–980, 510–560, 1060–1350, 590–700, 410–450, 370–400, 170–180; P_2 700–800, 550–560, 380–400, 140, 90–100, 50–60, 40–50; P_3 920–930, 750–800, –; Calculable ratios: LR_1 1.96–2.6 ['about 2'], BV_1 1.63; SV_1 1.1–1.3; LR_2 0.73, BV_2 5.16, SV_2 3.1. Foretibial spine 50 long, slender, curved outward.

Genitalia (Fig. 2D, I). TIX with cluster of 11–12 strong anal tergite setae extending to near base of anal point and apex of TIX. Anal point spatulate, protruding from anal tergite by 34. Superior volsella (Fig. 2I) 37–50 long, curved, tapering from microtrichiose base evenly to fine point. mv squat, 10–12, with 6 fine setae. Gcx 62, bulging, Gst 130, with tapered and curved apex.

Female (n=1–3) B.l. 3.4–3.9 mm, W.l. 1.7–1.8 mm. Head: Antenna flagellomere lengths 42–50, 38–57, 58–65, 65–67, 65–68, 100–113, A.R. 0.36–0.38; paired hyaline sensilla 25–30 long. 31 long clypeals, 3–4 aligned verticals. Palpomeres 25–35, 130–157, 220–227, 175–250.

Thorax. Ac uncountable, Dc 8 with 1 in humeral position; Pa 3–4, Scts 2.

Wing. Pattern as in Fig. 1C (from Freeman 1958: plate 2o). V.R. 1.27. Vein setation: R with 13–17, R_1 with 14–16 and R_{4+5} with 17–18.

Legs. All fore-femora slightly dilate, all depilate, thus length, strength and pigmentation of distal setae not discernible. Leg lengths: P_1 1050, 550, –; P_2 760–800, 580–650, 365–400, 150–170, 60–70, 55–60, 50–60; P_3 1100, 880, –. Calculable ratios: LR_2 0.61–0.63, BV_2 5.1–5.5, SV_2 3.61–3.67; Foretibial scale 50 long, gently curved (Fig. 1F).

Genitalia. Seminal capsule (Fig. 3D) pale, ovoid- spherical, 70 x 53, with thin neck prior to thicker-walled, gently curved spermathecal duct, becoming slightly dilate prior to fusion at apparent common opening. Cerci large, quadrate, 110 long by 88 wide in lateral view.

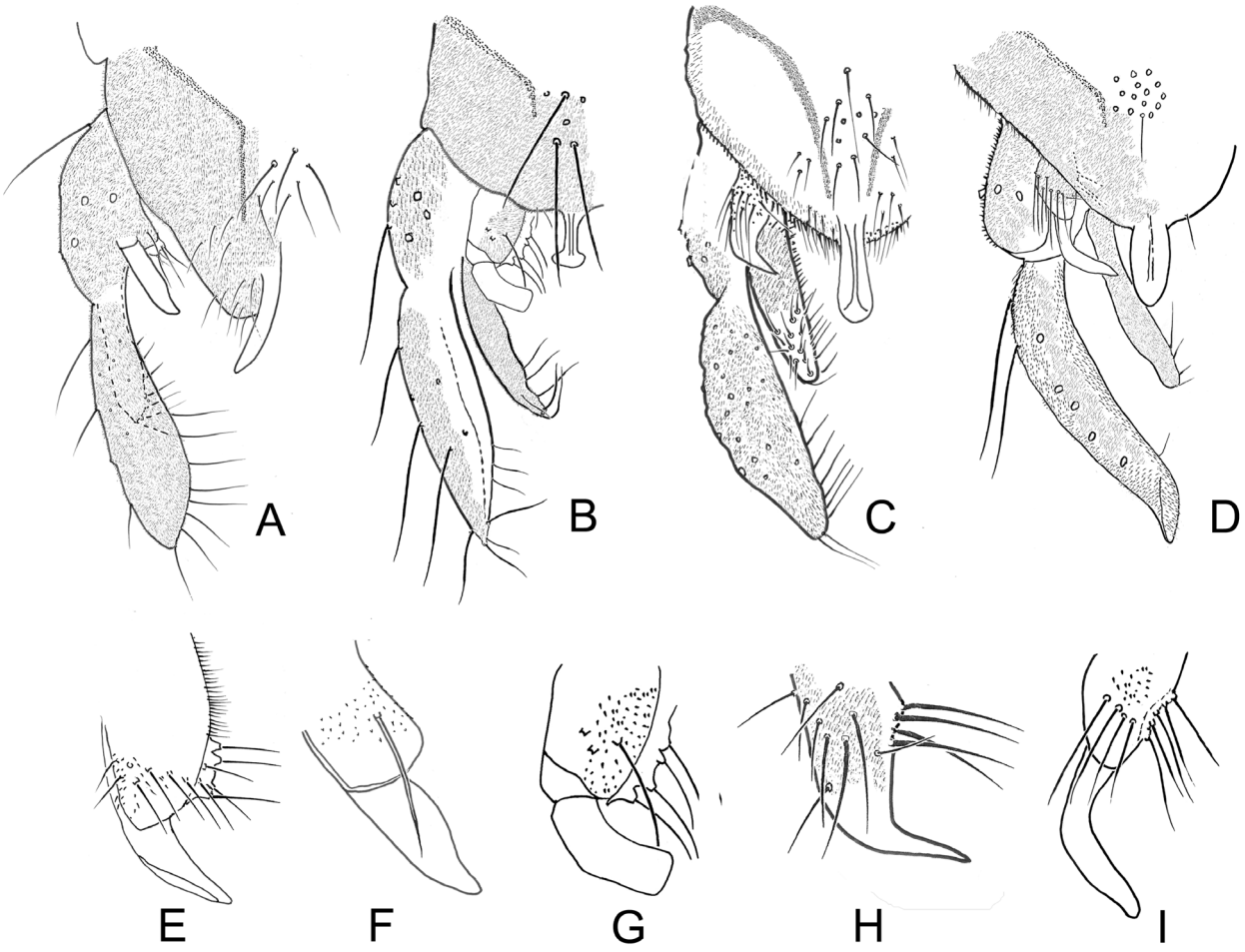

FIGURE 2. *Kribiodorum* spp., Male adults. A–D, hypopygium, left side, A. *K. kunene*, B, *K. malicky*, C, *K. perpulchrum*, D, *K. pulchrum;* E–I, superior volsella of E. *K. belalong*, F. *K. kunene*, G. *K. malicky*, H. *K. perpulchrum,* I. *K. pulchrum*.

Chironomus perpulchrum (Mitchell, 1908)

(Figs. 1A,D, L, 2C,H)

Lauterborniella perpulcher (Mitchell); Johannsen, 1937; Townes, 1945.
Stelechomyia perpulchra (Mitchell); Reiss, 1990
Kribiodorum perpulchra (Mitchell); Epler *et al*., 2013
Tendipedini sp. A; Roback (1953), Larva.

Material examined. 1Le/Pe/♂ (on 2 slides): CANADA, Québec, R. Rouge nr. Calumet, 1.v.1980, reared from dead roots of Acer (A. Borkent), CH9121 CNC Ottawa (ZSM).

Description (n=1)

B.l. 5.1mm, W.l. 2.6 mm.

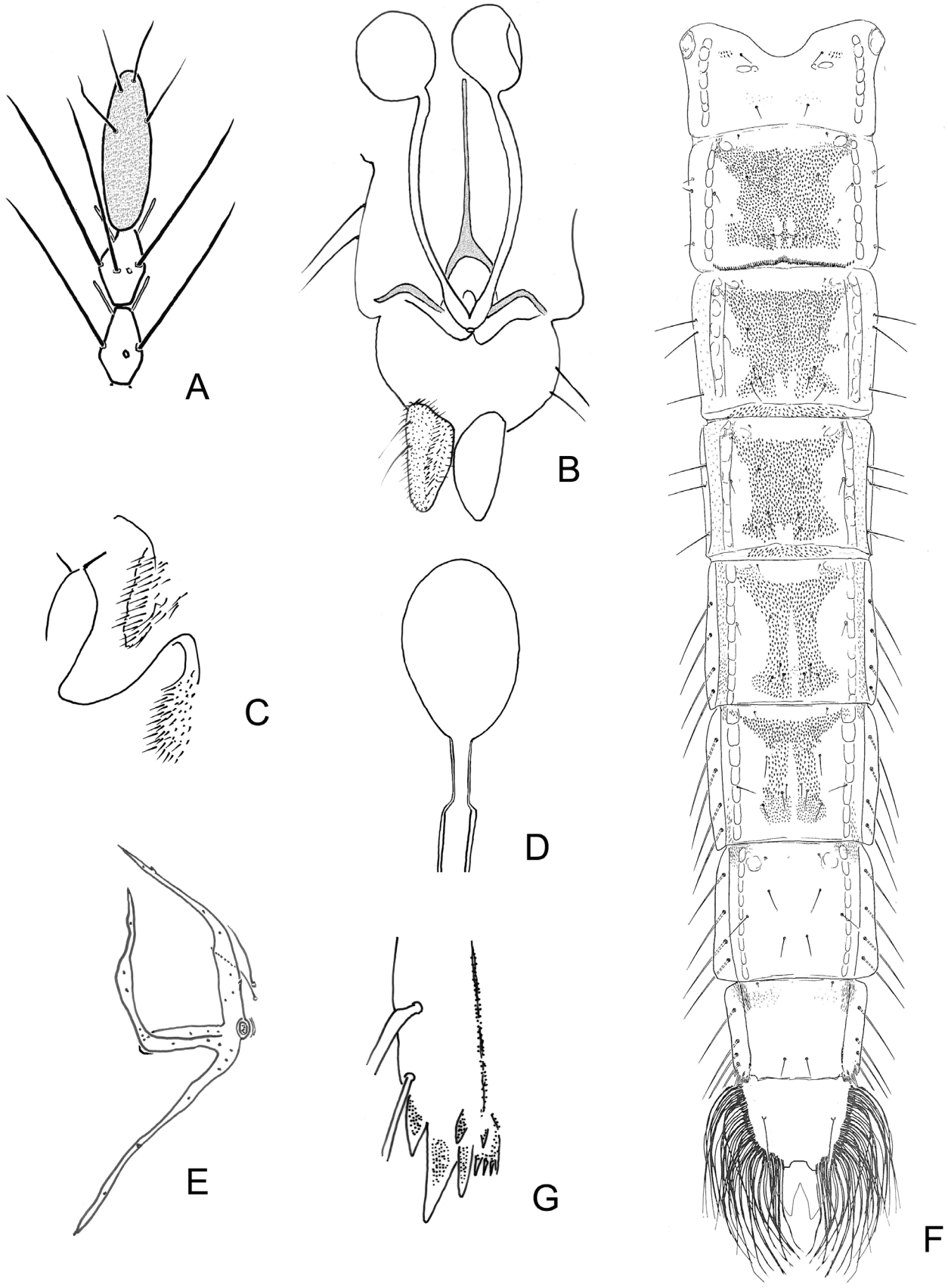

FIGURE 3. *Kribiodorum* spp., Female adult, A–C, *K. malicky*, D. *K. pulchrum.* A, Antenna, B, Genitalia, C, Lobes of gonapophysis VIII, D, spermatheca and duct. Pupa, *K. belalong*. E, Thoracic horn, F, Posterolateral corner ('spur') of VIII. G, Abdomen.

Head. Antenna. Fl_{1-12} 570, Fl_{13} 960, A.R. 1.68. 32 clypeals, 4 aligned verticals. Palpomeres (2–5) 63, 125, 205, 252. Thorax (Fig. 1A). Ac >5, Dc 9 with 1 in humeral position; Pa 4–5, Scts 4.

Wing (Fig. 1D) brown with clear base, clear areas in bases and apices of cells r_{4+5}, m_{1+2}, cu, forming two incomplete pale transverse bands. V.R. 1.19. Vein setation: R with 24, R_1 with 18, R_{4+5} with 19–21 in distal 2/3 only.

Legs. Apical femora strongly dilated, darkened, bearing dense dark long setae contrasting to pale setae arising from pale cuticle; apical 1/3 to 1/2 of Ta1 darkened (Fig. 1L); other tarsomeres on all legs with apical dark bands, or completely dark on ta_{3-5} (P_1) or only Ta_5 uniformly mid-brown. Lengths: P_1 1320, 760, 1520, 960, 68, 520, 200; $P_2$1240, 1060, 640, 280, 200, 140, 100; $P_3$1460, 1160, 800, 480, 400, 260, 120. Ratios: LR_1 2.0, LR_2 0.60, LR_3 0.53; BV_1 1.52, BV_2 4.08, BV_3 2.0; SV_1 1.39, SV_2 3.59, SV_3 3.78. Foretibial spine 70, tapering, sinuous.

Abdomen. Strongly and densely setose, more densely clustered medially, with setae at least 300 long.

Genitalia (Fig. 2C,H). TIX with 22 anal tergite setae in mid-tergite, setae stronger antero-medially and weaker posterolaterally, clustered between strong tergal bands. Anal point parallel-sided, downwardly curved seeming a little spatulate, protruding by 50 from squared-off anal tergite. Superior volsella (Fig. 2H) 100 long, curved, with microtrichiose base bearing 10–11 setae, directed posteriorly except median pair directed medially; digitus 60 long curved and tapering evenly to postero-medial directed fine point. Median volsella with 5–6 fine setae arising from tubercle bases forming squat, volsella. Gcx 120, gently rounded, Gst 190, not especially tapered, with rounded apex.

Ecology and Biogeography

The larval stages of *Kribiodorum* are known only for *K. perpulchra* with its xylophagous larva notably abundant on immersed wood in North American streams and rivers. In Mississippi larvae are abundant on wood in streams (Sabrina Cummings, University of Southern Mississippi, pers. comm. 2009), where they comprise a significant part of the diet of the Speckled Darter, *Etheostoma stigmaeum* (Alford & Beckett, 2006) with another xylophagous chironomid, *Xylotopus par* (Johannsen). It is likely, but unverified that congeners also are xylophagous, but within the distribution range of the genus, other than in N. America, this habitat is inadequately sampled.

The new species *K. kunene*, known only from its type-locality, confirms the prediction made in de Moor *et al.* (2000) concerning the aquatic biota of Kunene (Cunene) river. These authors discussed the biogeographic significance of the lower Kunene, pointing out its isolation in an arid region, and speculating on endemism amongst undescribed species. The authors are correct in this, and also in pointing out the continuing threat to the aquatic ecology of the lower river due to a long planned dam associated with the Bayes Hydropower project (de Moor *et al.* 2000).

The biogeography of the Chironomidae has influenced the wider field, most notably through the studies of Brundin (e.g. 1966), reviewed by Cranston (2005) with findings substantially confirmed by Cranston *et al*. (2010). Patterns predominantly involved taxa with 'typical gondwanan' distributions across the austral continents of South America, Australia and New Zealand. The genus discussed here, *Kribiodorum*, is not typically gondwanan, but shows a Nearctic, Afrotropical and Asian pattern. Although the southernmost part of Africa has gondwanan components (see Cranston *et al*., 2011), the presence of one species in the Nearctic and absence in South America and Australasia implies a different history. Other chironomids with a somewhat comparable pattern include *Conochironomus* Freeman (Cranston, 2016), *Nilodosis* Kieffer (Tang & Cranston, 2017), *Skusella* Freeman (Cranston & Tang, 2018) and *Paraskusella* (Cranston, 2018), all in the tribe Chironomini, and *Djalmabatista* Fittkau in the Tanypodinae. Whether these taxa share distributions stemming from common ancestry and vicariant speciation, or shared 'tropical' ecological tracking (dispersal) cannot be determined without full sampling and dating from molecular phylogenetics. Interestingly none of these taxa all were named from Asia, but have been found there more recently: some discoveries are coming from survey of the immature stages. It is probable that other such taxa are to be found.

Acknowledgements

I discussed the synonymy and species composition of *Kribiodorum* with the late Friedrich Reiss, and subsequently

with Martin Spies, both of the Zoologische Staatssammlung, Munich (ZSM) and I thank both for institutional loans. I thank also Helen James and Ferdy de Moor (Albany Museum, Grahamstown, South Africa) for locating and then loaning the specimen upon which the late Arthur Harrison had recognised an unpublished new species. Funding for research at the Kuala Belalong Field Studies Centre, Temburong District, Brunei Darussalam was provided by The Hong Kong and Shanghai Bank. Joe Charles, Bert Orr and Colin Maycock, then of the Universiti Brunei Darussalam, provided excellent logistical support.

References

Alford, J.B. & Beckett, D.C. (2006) Dietary specialization by the Speckled Darter, *Etheostoma stigmaeum*, on chironomid larvae in a Mississippi stream. *Journal of Freshwater Ecology*, 21, 543–551.
https://doi.org/10.1080/02705060.2006.9664115

Brundin, L. (1966) Transantarctic relationships and their significance, evidenced by chironomid midges. With a monograph of the subfamilies Podonominae and Aphroteniinae and the Austral Heptagyiae. *Kungliga Svenska vetenskapakademiens handlingar*, 11, 1–472.

Cranston, P.S. (1995) Morphology. *In:* Armitage, P.D., Cranston, P.S. & Pinder, L.C.V. (Eds.), *Chironomidae: Biology and Ecology of Non-Biting Midges*). Chapman & Hall, London, pp. 11–30.
https://doi.org/10.1007/978-94-011-0715-0_2

Cranston, P.S. (2005) Biogeographical History. *In*: Yeates, D.K. & Wiegmann, B.M. (Eds.), *The Evolutionary Biology of Flies*. Columbia University Press, New York, pp. 274–311.

Cranston, P.S. (2016) *Conochironomus* (Diptera: Chironomidae) in Asia: new and redescribed species and vouchering issues. *Zootaxa*, 4109 (3), 315–331.
https://doi.org/10.11646/zootaxa.4109.3.3

Cranston, P.S. (2018) *Paraskusella* Cranston, a new Afro-Australian genus in the tribe Chironomini (Diptera: Chironomidae). *Austral Entomology.*
https://doi.org:10.1111/aen.12366

Cranston, P.S., Dillon, M., Pinder, L.C.V. & Reiss, F.R. (1989) Keys and diagnoses of the adult males of the subfamily Chironominae (Diptera, Chironomidae). *Entomologica Scandinavica Supplement*, 34, 353–502.

Cranston, P.S., Hardy, N.B., Morse, G.E., Puslednik, L. & McCluen, S.R. (2010) When morphology and molecules concur: the 'Gondwanan' midges (Diptera: Chironomidae). *Systematic Entomology,* 35, 636–648.
https://doi.org/10.1111/j.1365-3113.2010.00531.x

Cranston, P.S., Hardy, N.B. & Morse, G.E. (2011) A dated molecular phylogeny for the Chironomidae (Diptera). *Systematic Entomology*, 37, 172–188.
https://doi.org/10.1111/j.1365-3113.2011.00603.x

Cranston, P.S. & Tang, H. (2018) *Skusella* Freeman (Diptera: Chironomidae): new species, immature stages from Africa, Asia and Australia, and expanded distributions. *Zootaxa*, 4450 (1), 41–65.
https://doi.org/10.11646/zootaxa.4450.1.3

Ekrem, T., Ashe, P., Andersen, T. & Stur, E. (2017) Chironomidae. *In*: Kirk-Spriggs, A.H. & Sinclair, B.J. (Eds.), *Manual of Afrotropical Diptera. Vol. 2. Nematocerous Diptera and lower Brachycera. Suricata 5*. South African National Biodiversity Institute, Pretoria, pp. 813–863.

Epler, J.H., Ekrem, T. & Cranston, P.S. (2013) The larvae of Chironominae (Diptera: Chironomidae) of the Holarctic region—keys and diagnoses. *In*: Andersen, T., Cranston, P.S. & Epler, J.H. (Sci. Eds.), *The larvae of Chironomidae (Diptera) of the Holarctic Region—Keys and diagnoses*. *Insect Systematics & Evolution*, 66 (Supplement), pp. 387–556.

Freeman, P. (1958) A study of the Chironomidae (Diptera) of Africa south of the Sahara. Part IV. *Bulletin of the British Museum (Natural History)*, Entomology, 6, 261–363.
https://doi.org/10.5962/bhl.part.17110

Johannsen, O.A. (1937) Aquatic Diptera. IV. Chironomidae : Subfamily Chironominae. *Memoirs of the Comell University Agricultural Experimental Station*, 210, 3–56.

Kieffer, J.J. (1921) Chironomides de l'Afrique équatoriale (1re partie). *Annales de la Societé entomologique de France*, 90, 1–56.

Mitchell, E.G. (1908) Descriptions of nine new species of gnats. *Journal of the New York Entomological Society*, 16, 7–14.

de Moor, F.C., Barber-James, H.M., Harrison, A.D. & Lugo-Ortiz, C.R. (2000) The macroinvertebrates of the Cunene River from the Ruacana Falls to the river mouth and assessment of the conservation status of the river, *African Journal of Aquatic Science*, 25, 105–122.
https://doi.org/10.2989/160859100780177857

Pinder, L.C.V. & Reiss, F. (1983) The larvae of Chironominae (Diptera: Chironomidae) of the Holarctic region. Keys and diagnoses. *Entomologica scandinavica Supplement*, 19, 293–435.

Pinder, L.C.V. & Reiss, F. (1986) The pupae of Chironominae (Diptera: Chironomidae) of the Holarctic region. Keys and diagnoses. *Entomologica Scandinavica Supplement*, 28, 299–456.

Pinho, L.C., Mendes, H.F. & Andersen, T. (2013) Revision of *Beardius* Reiss et Sublette, 1985 (Diptera: Chironomidae), with the description of twenty new species. *Zootaxa*, 3742 (1), 1–78.
https://doi.org/10.11646/zootaxa.3742.1.1

Reiss, F. (1982) *Hyporhygma* n. gen. und *Stelechomyia* n. gen. aus Nordamerika (Diptera, Chironomidae). *Spixiana*, 5, 289–302.

Reiss, F. (1990) Revision der Gattung *Zavreliella* Kieffer, 1920. *Spixiana*, 13, 83–115.

Roback, S.S. (1953) Savannah River tendipedid larvae (Diptera: Tendipedidae (= Chironomidae). *Proceedings of the Academy of Natural Sciences of Philadelphia*, 105, 91–132.

Sæther, O.A. (1980) A glossary of chironomid morphology terminology (Diptera: Chironomidae). *Entomologica scandinavica Supplement*, 14, 1–51.

Tang, H. & Cranston, P.S. (2017) *Nilodosis* Kieffer (Diptera: Chironomidae: Chironominae) from South China: a new species and generic overview. *Zootaxa*, 4353 (2), 339–346.
https://doi.org/10.11646/zootaxa.4353.2.5

Townes, H. (1945) The Nearctic species of Tendipedini (Diptera, Tendipedidae (= Chironomidae). *American Midland Naturalist*, 34, 1–206.
https://doi.org/10.2307/2421112