New species of *Caenis* (Ephemeroptera: Caenidae) from southern South Africa

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Four new species of the genus *Caenis* Stephens 1835 are described: *Caenis subota* n.sp., *Caenis helenae* n.sp., *Caenis parisi* n.sp. and *Caenis octulusa* n.sp. Previously known species found in this area are *Caenis basuto* and *Caenis capensis* (known from South Africa only), *Caenis brevipes* and *Caenis jinjana* (both widely distributed in tropical Africa; new for South Africa). A redescription of *C. basuto* and *C. capensis* is given. Most records are from the border region between the West and East Cape in the Tsitsikamma region, only a few kilometres from the sea; some others from an area south of Lesotho at the West end of the Drakensberg.

**Keywords:** *Caenis; South Africa; new species*

**Introduction**

The knowledge of the species of the family Caenidae in South Africa is incomplete. So far only a few representatives of three genera of the subfamily Caeninae have been reported: Provonsha and McCafferty (1995) described the new genus *Barnardara* with the type-species *Barnardara demoori* from Kruger National Park, East Transvaal, together with *Clypocaenis umgeni*, a new species of the genus *Clypeocaenis* Soldan, 1978. In 1932, Barnard described the first Caenidae from southern Africa: the new genus *Austrocaenis*, represented by *Austrocaenis capensis* from Lakeside, Cape Peninsula (Barnard 1932). On the base of paratypes deposited in the British Museum, Malzacher (1993) synonymised *Austrocaenis* with *Caenis*. So, after the description of *Caenis basuto* from Lesotho (Demoulin 1970) and *Caenis liebenauae* from the Umzimkulu river (Malzacher 1990), the genus *Caenis* was represented in South Africa by three species. Kimmins (1956) described *Caenis brevipes* and *Caenis jinjana* from East Africa. The material investigated here contains some specimens of these two species, which are the first records from South Africa. Together with four new species described in this paper, the number of South African *Caenis* is raised to nine, and of all Caenidae to 11. This number applies to the whole southern African region, with Albany Museum records showing Namibia, Botswana, Zimbabwe and Southern Mozambique (de Moor et al. 2000; de Moor and de Moor 2008a,b; H. Barber-James, personal communication). From
comparable regions we know 19 species from six genera (West Africa, Malzacher 2011) and 26 species from five genera (East Africa, Malzacher 1993).

Materials and methods
The investigated material, kindly made available to me by Dr Helen Barber-James, Grahamstown, is preserved in 75% ethanol. Two samples from an area at the southwestern end of the Drakensberg were collected in 1991 and 1993, the others from the border region between West and East Cape, south from the Tsitsikamma area in 2008 and 2009.

The majority of the material, including the types of the newly described species, is stored in the Albany Museum, Grahamstown, South Africa. A small number of additional specimens is preserved in the author’s collection, and will eventually be entrusted to the Natural History Museum, Stuttgart.

Systematic account

*Caenis basuto* Demoulin, 1970 (Figures 1; 2a–f, h, j; 3; 4)

Material examined

4♂♂, South Africa, Upper Buffels River, 33°58′, 56.8″ S, 23°28′ 43.9″ E, 10.04.2008, (TSR-146A). –50♂♂, 1♀♀ SI (subimagos), 4♀♀, Lower Buffels River, 33°59′ 07.9″ S, 23°27′ 48.7″ E,

Figure 1. *Caenis basuto*, ♀ (a–d) Genitalia with different penis shapes: (a) total view and sternum IX, with epidermal pigments; (e–g) different shapes of prosternal triangle.
Measurements and colouration. Body length 2.8–3.2 mm (TSR-148B, TSR-146A); 3.5–3.7 mm (TSR-404A, TSR 344E); wing length 2.3–2.6 mm (TSR-148B, TSR-146A); 2.9–3.0–mm (TSR-404A, TSR 344E); length of foreleg 1.9–2.3 mm (TSR-148B, TSR-146A); 2.3–2.5 mm (TSR-404A, TSR 344E); ratio of forefemur : foretibia 0.55–0.63; ratio of foretibia : foretarsus 1.20–1.35; ratio of foreleg : hind leg 1.53–1.77; ratio of first segment of the foretarsus : 2nd : 3rd : 4th : 5th 1 : 3.6–4.7 : 1.6–2.4 : 1.1–1.9 : 1.3–2.0; ratio of body length : length of cercus : length of terminal filament 1 : 2.5–2.7 : 3.3–3.8; ratio terminal filum : cercus 1 : 1.30–1.40.

Colouration of cuticle. Meso- and metanotum yellow to yellowish-brown (TSR 148B) or medium brown (TSR 404A); other parts white or yellowish-white.

Epidermal pigmentation. Pigmentation of dorsal and lateral side as in Figures 3 and 4.
Distinctive features. Pronotum with two transverse lines, sometimes with two paramedian points; abdominal terga (I), II; VII, VIII, (IX) with median lightenings; segments II–VI with paratergal and parasternal spots; segments VII–IX with long parallel dashes on paratergites and parasternites. Mid coxae bordered by two dorsoventral dashes. Femora with strong preapical spots. Margins of mentum with blackish pigments. Conspicuous central black spots on abdominal sterna.

Head. Frontal line forming an angle (Figures 3 and 4, left). Dorsal part not conspicuously domed; outline labrum-tip – vertex-base in lateral view irregularly semielliptical (Figure 2j). Base of antennal flagellum not dilated (Figure 2h). Rudiments of mouthparts strongly protruding ventrally (Figure 2j). Eyes in lateral view a little irregular, resembling a rounded triangle (Figures 3 and 4).

Thorax. Prothorax protruding laterally (Figures 3 and 4, left). Prosternal triangle equilateral or slightly isosceles with concave sides (small specimens) or with narrowly extended tip (large specimens) (Figure 1e–g).

Abdomen. Lateral filaments of abdominal segments short or lacking (the material described here) or of medium length (type specimens from Lesotho). Finger-like process on tergite II lacking.

Genitalia and sternum IX. As in Figure 1a–d. Penis more or less rectangular, lobes sometimes slightly protruding laterally (Figure 1a–d). Styliger plate broadly rectangular; styliger sclerite with thin apophyses. Forcipes (Figure 2a–f) relatively
short with broad basal part, apically narrowed and bent forming a sclerotised tip, sometimes two-pointed or accompanied with one or few very thin spines; inner margin with two or three short bristles (sensillae?). Ratio of the distance between the extreme lateral points of the forceps bases to forceps length 1.6–1.8.

Female imago

Measurements and colouration. Body length could not be measured because all available females had lain their eggs; wing length 3.0–3.7 mm. Same characteristic colouration as in males. In particular, the central spots on abdominal sternites enable the identification.

Morphology. Not different from males.

Larval stage

Unknown.

Differential diagnosis

*Caenis basuto* can be distinguished from all other *Caenis* species by the following combination of characters: head comparatively flat, outline labrum-tip – vertex-base in lateral view irregularly semielliptical (Figure 2j). Frontal line of head forming an
angle (Figures 3 and 4, left). Antennal flagellum basally not dilated (Figure 2h). Prothorax protruding laterally (Figures 3 and 4, left). Penis broadly rectangular or with very short lobes. Forcipes apically pointed, without tuft of spines, basal part with straight and more or less parallel sides, apical part bent with concave inner margin (Figure 2a–f). Forcipes and genital sclerites nearly uncoloured. Tergite II without finger-like process. Abdominal terga with specific pigmentation (Figures 3 and 4, left).

**Caenis subota n.sp.** (Figures 2g, i; 5; 6)

**Material examined**

*Holotype.* $1\delta$ (micro-slide), South Africa, Wildebees River, $31^\circ 11' 04''$ S, $28^\circ 08' 14''$ E, 26.03.1993, (ECR-119A)

*Paratypes.* $135\delta\delta$, South Africa, Wildebees River, $31^\circ 11' 04''$ S, $28^\circ 08' 14''$ E, 26.03.1993, (ECR-119A) – 20 larvae, South Africa, KuNtombizinini River, Maclear, $31^\circ 08' 40''$ S, $28^\circ 17' 30''$ E, 26.03.1991, (ECR 96A).

**Male imago**

**Measurements and colouration.** Body broad and stocky (Figure 5), body length 2.7–3.0 mm; wing length 2.5–2.8 mm; length of foreleg 1.8–2.2 mm; ratio of forefemur : foretibia 0.51–0.56; ratio of foretibia : foretarsus 1.24–1.31; ratio of
foreleg : hind leg 1.54–1.60; ratio of first segment of the foretarsus : 2nd : 3rd : 4th : 5th 1 : 3.8–4.2 : 1.5–1.9 : 1.3–1.5 : 1.3–1.7; ratio of body length : length of cercus : length of terminal filament 1 : 2.7–2.9 : 3.7–4.0; ratio terminal filum : cercus 1 : 1.36–1.40.

Colouration of cuticle. Meso- and metanotum yellow to yellowish-brown; other parts white or yellowish-white.

Epidermal pigmentation. Pigmentation of dorsal and lateral side as in Figure 4. In principle very similar to that of *C. basuto* but reduced and of lower intensity. Even in stronger coloured specimens central spots on abdominal sterna as well as paratergal and parasternal spots are lacking.

Figure 6. *Caenis subota*, larva. (a) Sternum IX, male, with subimaginal genitalia, (b) marginal setation of segment VII, (c) marginal setation of segment V, (d) claw of foreleg, (e) claw of mid leg, (f) claw of hind leg, (g) setation of mid leg, (h) coxal process of hind leg, (i) coxal process of middle leg, (j) transverse row of bristles on dorsal side of forefemur, (k) bristles from transverse row on forefemur, (l) operculate gill, general view, (m) bristles from hind margin of operculate gill, (n) microtrichia from ventral side of operculate gill.
Head. Frontal line rounded (Figure 5, left). Dorsal part domed; outline labrum-tip – vertex-base in lateral view semicircular (Figures 2i and 5, right). Rudiments of mouthparts only slightly protruding ventrally (Figure 2i). Base of antennal flagellum not dilated. Eyes in dorsal view a little smaller and fewer domed as in \( C. \) basuto, in lateral view nearly circular (Figure 5).

Thorax. Sides of prothorax more or less straight (Figure 5, left). Prosternal triangle equilateral with concave sides (like Figure 1g).

Abdomen. Lateral filaments of abdominal segments short or lacking; without finger-like process on tergite II.

Genitalia and sternum IX. Very similar to \( C. \) basuto; with high variability in both species. Penis often with short, laterally protruding lobes. Tips of forceps with one or few accompanied spines seems to be the rule (Figure 2g).

Female imago
Unknown.

Larva

This description is based on three final instar larvae with visible subimaginal genitalia (Figure 6a). The assignment to \( Caenis \) subota (and not to \( Caenis \) basuto) is based on the fact that the record of the larvae is (with a distance of 15 km) close to the locus typicus of \( Caenis \) subota, on the western end of the Drakensberg. The records of \( Caenis \) basuto described here are all located near Tsitsikamma.

Measurements and colouration. Male larva, last instar body length 3.3–3.5 mm, length of cerci 1.8 mm. Female larva, last instar: body length 4.2 mm.

Colouration of cuticle. Yellowish-brown.

Epidermal pigmentation. No pigments visible.

Head. Genae not bulged. Labrum with diverging sides and broadly rounded corners, anterior margin slightly concave. Mandibles without setae. Second segment of labial palp about 1.4 the length of the third one (along the centre-line).

Thorax. Sides of pronotum parallel or converging a little anteriorly, slightly convex. Coxal processes narrow, sickle-shaped, not bulging out from the outline (Figure 6h,i). Femora and tibiae with spatulate bristles. Similar bristles forming the transverse row on forefemur (Figure 6j,k). All tarsi ventrally with two long rows of bristles; bristles of the outer row long and strong, mostly simple, of the inner row shorter and more or less pinnate. Tip of mid and hind claws strongly bent (Figure 6e,f), mid and foreclaw with a row of strong denticles (Figure 6d,e), hind claw with two or three basal denticles and a long row of very fine microdenticles (heterodont) (Figure 6f).

Abdomen. Abdominal segments with short posterolateral processes. Lateral bristles posteriorly decreasing in length, very short on segments VIII and IX (Figure 6b,c). Hind margin of sternum IX with a shallow indentation (Figure 6a). Posteriomedian process of tergum II short, broadly triangular. Operculate gills with short and thin bristles on medial margin, lateral margin and lateral part of hind margin with spatulate bristles contrasting strongly with the long and thin bristles of medial hind margin; medial ridge with about seven strong bristles, further two or three on lateral surface (Figure 6l and m). Ventral row of microtrichia runs to the
middle of the hind margin of the gill. Shape of microtrichia as in Figure 6n. Cerci with short, strong and pointed spines and longer thin bristles.

Differential diagnosis

*Caenis subota* can be distinguished from all other *Caenis* by the following combination of characters. Male imago: Body-shape stocky (Figure 5). Head dorsally domed, outline labrum-tip – vertex-base in lateral view semicircular (Figure 2i). Frontal line of head rounded (Figure 5, left). Antennal flagellum basally not dilated (Figure 2h). Prothorax not projecting laterally, sides more or less straight, slightly converging anteriorly (Figure 5, left). Penis with very short lobes or broadly rectangular (Figure 1a–d). Forcipes apically pointed, without tuft of spines, basal part with straight and more or less parallel sides, apical part bent with concave inner margin (Figure 2a–g). Forcipes and genital sclerites nearly uncoloured. Tergite II without finger-like process. Pigmentation of abdominal terga reduced. Larva: Tibiae and tarsi medially with a row of long and strong spines (Figure 6g). Coxal processes of middle and hind legs narrow, sickle-shaped, not bulging out from the outline (Figure 6h,i). Transverse row on forefemur irregular, consisting of very large spatulate bristles (Figure 6j, k). Hind margin of abdominal sternum IX with a shallow indentation, anteriorly a large field of rows of microdenticles (Figure 6a).

Etymology

The name of the new species is an anagram of *C. basuto*. It was used because of the similarity of these two species, particularly their nearly identical genitalia.

**Caenis capensis** Barnard, 1932 (Figure 7; 8a–f)


Male imago

Measurements and colouration. Body length 3.5–4.0 mm (paratypes from Lakeside, Cape Peninsula, compare Malzacher 1993), 5.0–5.2 mm (TSR-402A); wing length 3.3–3.5 mm (paratypes), 3.6–4.0 mm (TSR-402A); length of foreleg 3.1–3.2 mm (paratypes), 4.0–4.2 mm (TSR-402A). Ratio of forefemur : foretibia 0.41–0.51; ratio of foretibia : foretarsus 1.06–1.16 (paratypes), 1.34–1.41 (TSR-402A); ratio of foreleg : hind leg 2.02–2.05 (paratypes), 2.22–2.24 (TSR-402A); ratio of first segment of the foretarsus : 2nd : 3rd : 4th : 5th 1 : 3.8 : 3.1 : 4.6–5.0 (paratypes), 5.3–5.7 (TSR-402A) : 1.8–2.4 : 1.8–2.1 : 1.4–1.8. Ratio of body length : length of cercus : length of terminal filament 1 : 3.0–3.3 : 3.3–3.7. Ratio terminal filum : cercus 1: 1.11–1.12.
**Colouration of cuticle.** Meso- and metanotum yellow or yellowish-brown; other parts white or yellowish-white.

**Epidermal pigmentation.** Pigmentation of dorsal and lateral side as in Figure 7.

**Distinctive features.** Pattern on pronotum consists of diffuse spots. Abdominal terga VII–IX medially with an extended white mark, anteriorly pointed and continued as a thin line on terga in front. Femora with preapical spots prolonged basally in fine lines. Blackish dash on posterior margin of submentum; a dark line running laterally from hind corners of prosternal triangle. Other parts of ventral side almost unpigmented.

**Head.** Base of antennal flagellum dilated; dilated part 1.2–1.4 length of pedicel.

**Thorax.** Prosternal triangle relatively broad, sides straight (paratypes) or more or less concave, apically broadly rounded, cut or open (Figure 8e). Scutellum posteriorly broadly rounded, tip inconspicuous or lacking, sides a little bent, (Figure 8f).

**Abdomen.** Lateral filaments of abdominal segments rather long (like Figure 10i, see also Malzacher 1993, fig. 18b); no finger-like process on tergite II.

**Genitalia and sternum IX.** As in Figure 8a–c (Malzacher 1993, fig. 18b). Penis lobes triangular, basally broad, equilateral or isosceles. Apophyses of styliger sclerite long and broad, more or less bent medially. Other sclerites inconspicuous. Forcipes

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Figure 7. *Caenis capensis* ♂. Microphotograph of body, with pigment pattern; dorsal view (left), lateral view (right).
of medium length, evenly bowed or apical part more or less abruptly bent; apical spines thin and quite short (Figure 8d), a little longer in the paratypes (Malzacher 1993, fig. 18c). Ratio of the distance between the extreme lateral points of the forceps bases to forceps length 1.2–1.4.

Female imago
Unknown.

Larva
See Malzacher 1993: 413.

Differential diagnosis

*Caenis capensis* is a TPA-species (see Discussion) and can be distinguished from all other species of this group by the following combination of characters. Ratio forefemur : foretibia ≤ 0.5. Ratio foreleg : hind leg ≥ 2.00. Ratio foreleg tarsal segment II : I ≥ 4.5. Tuft of forceps spines short, ratio shaft : tuft 6.5–9.8. Penis lobes basally broad, equilateral or isosceles (Figure 8a–c) Forcipes bowed or medially bent (Figure 8d). Apophyses of styliger sclerite long and broad, more or less bent medially (Figure 8a–c). Forcipes and genital sclerites uncoloured. Lateral...
filaments of abdominal segments rather long (like Figure 10i). Tergite II without finger-like process.

*Caenis helenae* n.sp. (Figures 8g; 9; 10)

**Material examined**

*Holotype.* 1♂ (micro-slide), South Africa, Matjies River, 33°58′42.5″ S, 23°27′40.8″ E, 17.01.2008, (TSR-10A).


![Figure 9](image-url)  

Figure 9. *Caenis helenae* ♂. Microphotograph of body, with pigment pattern; dorsal view (left), lateral view (right).
Male imago

Measurements and colouration. Body length 3.5–4.5 mm; wing length 3.0–3.5 mm; length of foreleg 2.3–3.2 mm. Ratio of forefemur : foretibia 0.50–0.59 (0.45-0.47 TSR 148B); ratio of foretibia : foretarsus 1.60–1.98; ratio of foreleg : hind leg 1.71–1.87; ratio of first segment of the foretarsus : 2nd : 3rd : 4th : 5th 1 : 2.0–3.4 : 1.5–2.7 : 1.0–2.1 : 1.3–1.9; ratio of body length : length of cercus : length of terminal filament 1 : 2.4–2.5 : 3.0–3.2; ratio terminal filum : cercus 1 : 1.17–1.28.

Colouration of cuticle. Meso- and metanotum yellow or yellowish-brown; other parts white or yellowish-white.

Epidermal pigmentation. Pigmentation of dorsal and lateral side as in Figure 9.

Distinctive features. Frons and vertex black; two paramedian lines on pronotum; suturae on mesonotum pigmented; intense pigmentation of abdominal terga I and II; intense pigment dashes surrounding coxae; segments II–VI with short paratergal and parasternal dashes (anteriorly and posteriorly often fused together); segments VII–IX with spots and dashes only on paratergites. Forefemora and tibiae greyish, femora with preapical spots. Intense blackish dash on posterior margin of submentum and on the sides of prosternal triangle; a blackish spot on the tip seems to lengthen the triangle (Figure 10f), a bowed dark line is running from the hind corners laterally. Blackish-grey marks on meso- and metasternum and anterior abdominal sterna, more and more diminished posteriorly.

Figure 10. Caenis helenae ♂. (a–c) Genitalia with different penis shapes, (a) total view and sternum IX, (d) different shapes of forcipes, (e–g) different shapes of prosternal triangle, (f) with epidermal pigments, (h) antennal scape, pedicel and base of flagellum, (i) margins of abdominal segments III–VIII with lateral processes.
Head. Base of antennal flagellum dilated; dilated part 1.5 length of pedicel (Figure 10h).

Thorax. Prosternal triangle anteriorly rounded, often bell-shaped (Figure 10e–g). Scutellum with straight sides, posteriorly more or less pointed (Figure 8g).

Abdomen. Lateral filaments of abdominal segments moderate to long, basally broadened on segments VI–VIII (Figure 8i). Finger-like process on tergite II lacking.

Genitalia and sternum IX. As in Figure 10a–c. Penis voluminous; penis lobes long, relatively narrow, often a little bowed, sickle-shaped, broadly rounded apically. Styliiger plate more or less broadly rectangular; apophyses of styliiger sclerite moderate, broad. Forcipes straight or a little bent, gradually broadened at base; apical spines long, their bases terraced (Figure 10d). Ratio of the distance between the extreme lateral points of the forcipes bases to forcipes length 1.4–1.5.

Female imago

Measurements and colouration. Body length 4.8–6.7 mm; wing length 4.0–5.0 mm.

Same colouration as in males.

Distinctive characters. Include dark lines on mesonotum, blackish spot in front of prosternal triangle, pattern on meso- and metasterna and paratergal and parasternal dashes enable the identification of females.

Morphology. Not different from males

Eggs

Chorion nearly smooth. Two very flat epithemata. Micropyle probably lacking.

Larval stage

Unknown.

Differential diagnosis

Caenis helenae is a TPA-species (see Discussion) and can be distinguished from all other species of this group by the following combination of characters. Ratio forefemur : foretibia 0.50–0.59. Ratio foreleg : hind leg 1.71–1.87. Prosternal triangle anteriorly rounded, often bell-shaped, with a blackish spot on the tip (Figure 10e–g). Penis lobes long, relatively narrow, a little bowed, sickle-shaped, broadly rounded apically. Styliiger plate more or less broadly rectangular (Figure 10a–c). Tuft of forcipes spines long (Figure 10d), ratio shaft : tuft 3.3–3.8. Forcipes and genital sclerites uncoloured. Lateral filaments of abdominal segments moderate to long. Tergite II without finger-like process.

Etymology

The species is dedicated to Dr Helen M. Barber-James, Grahamstown, South Africa, who left me the material for investigation, in recognition of her contributions to South African mayflies.

Caenis parisii n.sp. (Figures 11; 12)
Material examined

Holotype. 1♂ (micro-slide), South Africa, Lower Groot River East, 34°02′ 05.1″ S, 24°12′ 27.2″ E, 17.01.2009, (TSR-440M) – Paratypes. 3♂♂, 2♀♀ SI, Lower Groot River East, 34°02′ 05.1″ S, 24°12′ 27.2″ E, 17.01.2009, (TSR-440M).

Male imago

Measurements and colouration. Body length 3.0–3.4 mm; wing length 2.6–2.9 mm; length of foreleg 2.3–2.5 mm. Ratio of forefemur : foretibia 0.54–0.67; ratio of foretibia : foretarsus 1.49–1.85; ratio of foreleg : hind leg 1.50–1.67; ratio of first segment of the foretarsus : 2nd : 3rd : 4th : 5th 1 : 2.2–3.2 : 1.5–2.1 : 1.0–1.4 : 1.1–1.3.

Colouration of cuticle. Femora, meso- and metathorax maroon, with blackish-brown sutures or edges; thoracic sterna a little lighter; other parts light yellowish-brown.

Epidermal pigmentation. Pigmentation of dorsal and lateral side as in Figure 11.

Distinctive features. Frons and vertex black; pronotum with two paramedian pale spots, which together with the surrounding pigment pattern give the impression of a mask-like figure; metanotum with a central rectangular blackish mark; abdominal terga more or less evenly greyish pigmented. Femora without spots. Foretibiae greyish pigmented. Posterior margin of submentum and apices of maxillary palp rudiments blackish-brown; basal part of prosternal triangle, meso-

Figure 11. Caenis parisi ♂. Microphotograph of body, with pigment pattern; dorsal view (left), lateral view (right).
and metasterna greyish shaded; abdominal sterna with broad grey transverse bands; paratergal and parasternal dashes inconspicuous.

**Head.** Base of antennal flagellum dilated; dilated part 1.2 times as long and about half as broad as pedicel.

**Thorax.** Broader as in *C. helenae*. Prosternal triangle equilateral with concave sides (Figure 12e).

**Abdomen.** Lateral filaments of abdominal segments short or lacking. Without finger-like process on tergite II.

**Genitalia and sternum IX.** As in Figure 12a–c. Penis large, elongated posteriorly. Penis lobes long, variable in shape. Styliger plate posteriorly protruding and rounded. Styliger sclerite with long and relatively narrow apophyses. Lateral sclerite short. Central sclerite triangular, posteriorly rounded. Forcipes medially more or less bent, with long apical spines (Figure 12d). Ratio of the distance between the extreme lateral points of the forceps bases to forceps length 0.9–1.2. Sclerites and forcipes brown to dark brown (forcipes and basolateral sclerites).

**Female and larval stage**

Unknown.
Differential diagnosis

*Caenis parisi* is a TPA-species (see Discussion) and can be distinguished from all other species of this group by the following combination of characters. Ratio forefemur : foretibia 0.54–0.67. Ratio foreleg : hind leg 1.50–1.67. Ratio foreleg tarsal segment II : I 2.2–3.2. Tuft of forceps spines long, ratio shaft : tuft 3.2–4.0. Penis lobes long, more or less bowed, sickle shaped. Styliger plate posteriorly prolonged and rounded. Apophyses of styliger sclerite straight, of medium length. Central sclerite round. Lateral sclerite short triangular (Figure 12a–c). Forceps straight or slightly bent (Figure 12d). Forceps and genital sclerites brown. Black pigment spot on base of central sclerite (Figure 12a–c) Lateral filaments of abdominal segments short or lacking. Tergite II without finger-like process.

Etymology

The species is named after the legendary Grecian Paris, son of the last king of Troy, together with Helena a protagonist of the Ilias.

*Caenis octulusa n.sp*, (Figures 13; 14)

Figure 13. *Caenis octulusa ♂*. Microphotograph of body, with pigment pattern; dorsal view (left), lateral view (right).
Material examined


Male imago

Measurements and colouration. Body length 5.2 mm; wing length 4.4 mm; length of foreleg 3.8 mm. Ratio of forefemur : foretibia 0.53–0.56; ratio of foretibia : foretarsus 1.64–1.72; ratio of foreleg : hind leg 1.59–1.72; ratio of first segment of the foretarsus : 2nd : 3rd : 4th : 5th 1 : 2.0–2.3 : 1.8 : 1.6–1.8 : 1.7.
**Colouration of cuticle.** Meso- and metathorax strongly brown; central parts of sternum lightened; longitudinal sutures of mesonotum dark-brown. Head, pronotum and legs lighter brown; coxae and femora with dark-brown edges. Other parts brownish-white.

**Epidermal pigmentation.** Pigmentation of dorsal and lateral side as in Figure 13.

**Distinctive features.** Dorsal head strongly blackish-brown pigmented with two lighter transverse bands on posterior vertex and between vertex and frons. Pronotum with a pattern of dark-grey lines and dashes. Prealar bridges strongly pigmented. Pigmentation of submentum and prosternum similar to that in *Caenis helenae*. Sutures of mesonotum blackish-brown edged. Abdominal terga diffusely greyish, segments VII–IX with blackish elongated paratergal and parasternal dashes, anterior segments with paratergal spots and parasternal dashes, all strongly contrasting to the weakly pigmented terga. Femora with preapical spots.

**Head.** Base of antennal flagellum dilated; dilated part as long and about half as broad as pedicel (Figure 14c).

**Thorax.** Prosternal triangle apically rounded, nearly equilateral with straight sides slightly convex in their posterior part (Figure 14d).

**Abdomen.** Lateral filaments of abdominal segments of medium length. Without finger-like process on tergite II.

**Genitalia and sternum IX.** As in Figure 14a. Penis with longish triangular lobes, their posterior margins a little convex. Styliger sclerite semielliptical with long slightly bent apophyses. Lateral sclerites very long and narrow. Central sclerite triangular and pointed. Forcipes relatively short, sides evenly converging apically; tuft of spines compact and of medium length (Figure 14b). Sclerites, forcipes and basolateral parts of segment IX brown; lateral sclerites, basolateral sclerites and bases of forcipes blackish-brown. Ratio of the distance between the extreme lateral points of the forcipes bases to forcipes length 1.7.

**Female and larval stage**

Unknown.

**Differential diagnosis**

*Caenis octulusa* is a TPA-species (see Discussion) and can be distinguished from all other species of this group by the following combination of characters. Ratio forefemur : foretibia 0.53–0.56. Ratio foreleg : hind leg 1.59–1.72. Ratio foreleg tarsal segment II : I 2.0–2.3. Tuft of forcipes spines moderate, ratio shaft : tuft 5.0–6.2. Prosternal triangle nearly equilateral with straight sides slightly convex in their posterior part (Figure 14d). Penis lobes long, conical, hind margin convex. Styliger plate with nearly parallel sides and rounded hind margin. Apophyses of styliger sclerite long and slightly bent. Central sclerite triangular and pointed. Lateral sclerite very long and narrow (Figure 14a). Forcipes evenly converging apically (Figure 14b). Forcipes and genital sclerites brown. Lateral filaments of abdominal segments of medium length. Tergite II without finger-like process.

**Etymology**

The name of the new species is an anagram of the West Palaearctic species *Caenis luctuosa* because of their similarities in size, colouring and genital morphology.
**Caenis jinjana** Kimmins, 1956 (Figure 15c, d)


**Material examined**


**Description**


First record for South Africa. The species is widely distributed in tropical Africa (see de Moor et al. 2000).

**Caenis brevipes** Kimmins, 1956 (Figure 15a, b)


**Material examined**

14♂, Mooi River, 31°05'00" S, 28°18'00" E, 22.03.1991, (ECR-54C).

**Description**


First record for South Africa. The species is widely distributed in tropical Africa.

**Discussion**

**Taxonomy and relationships**

The specimens of *C. basuto* described here and the type specimens from Lesotho differ a little in the length of foreleg and proportions of genitalia and clearly in the length of lateral filaments of abdomen (see Malzacher 1993, fig. 4). However, the question if these specimens represent two different species can only be answered by studying a greater number of populations from all over the region.

*C. basuto* and *C. subota* can be distinguished not only from the other species described here but – apart from *C. edwardsi* – from all other African *Caenis* species by the shape of the forcipes, which are apically pointed with the inner margin concave in its apical part and straight basally (forcipes of *C. edwardsi* are also pointed but more straight and regularly shaped (see Kimmins 1939). The other species described here, *C. capensis*, *C. helenae*, *C. parisi* and *C. octulusa* seem to be closely related. *Caenis capensis* differs from the other three species in length and proportions of the forelegs, particularly the very long tarsal segment II.

These four species are members of a large species-group that I will call the TPA-group, because they all show the following combination of characters:

- Tuft of strong spines on forcipes apex
- Penis lobes laterally protruding and more or less triangular
- Antennal flagellum basally dilated, dilated part at least as long as the pedicel.

In *C. liebenauae* described from the Umzimkulu River, Natal (Malzacher 1990) the antennal flagellum is not dilated basally and pedicel is longer than in most of the
other *Caenis* species. Forcipes are short with very thin apical spines. Moreover, the head is short and broad with small, oval eyes (see Malzacher 1990, fig. 12).

The TPA-group species are very abundant and distributed all over the African continent. Of the 36 known species, 22 belong to the TPA-group, the dilated antennal flagellum is realised in 25 species, triangular penis lobes are shown in 26 species, and forcipes with a tuft of spines in 30 species. Some other species of the TPA-group occur in the Palearctic and Oriental regions and in Madagascar, but they do not seem to be present in the Neotropics and Nearctic.

**Distribution**

Most species – *C. basuto*, *C. capensis*, *C. helenae* and *C. octulusa* – are from a small area of about 75 km², around the N2 highway, about 200 km west of Port Elizabeth. *Caenis basuto* is also present in localities about 130 km west of Port Elizabeth, together with *C. parisii*. Two other samples are from an area about 60 km northwest of Umtata at the southwestern end of the Drakensberg. Besides *C. helenae*, another new species, *C. subota*, has been found here together with *C. brevipes* and *C. jinjana*, both widely distributed in Africa. In general, *C. capensis* is widespread from the southwest Cape to Natal (Crass 1947).

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**References**


