

BITING MIDGES OF THE GENUS CERATOPOGON FROM NEW GUINEA (Diptera : Ceratopogonidae)¹

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Abstract : *Ceratopogon* is little known from New Guinea and 5 species are described as new to science: *C. petersi*, *C. novaguineae*, *C. papuensis*, *C. maai* and *C. fuscipennis*.

As the fourth report of my studies on New Guinea Ceratopogonidae, this paper concerns five *Ceratopogon* species from New Guinea, New Ireland and New Britain. So far as I know, species of *Ceratopogon* are little known from New Guinea and neighboring islands and these 5 species are considered new to science.

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Abbreviations : AR (antennal ratio) is the combined length of distal 5 segments to that of the basal 8 taken together. CR (costal ratio) is the length of the costal vein to that of the wing both measured from the incision between the alula and squama. CRL is the combined relative length of antennal segments. RL is the relative length measured by an ocular micrometer under a magnification of 150 (1 unit=0.013 mm) for wing veins and under a magnification of 600 (1 unit=0.003 mm) for the antenna, maxillary palpus, legs, wing veins of some minute species, spermatheca and ♂ hypopygium. RL-A is the relative lengths of antennal segments (Arabic numeral before A shows the number of the distal antennal segments). RL-L is the relative lengths of the leg segments, excluding the coxa and trochanter. RL-V is the relative lengths of wing veins R, M, stem of fMCu, R₁ and Rs. TR is the tarsal ratio showing the relative length of tarsal segment I to II. Roman numeral shows the ordinal number of the segment of the antenna, palpus, tarsus, abdomen, etc.

Genus *Ceratopogon* Meigen (1803)

Synonym : *Helea* Meigen (1800), *Brachypogon* Kieffer (1899), *Psilohela* Kieffer (1915), *Isohela* Kieffer (1917), *Anakempia* Kieffer (1924), *Trishelea* Kieffer (1924), *Fanthamia* de Meillon (1939).

KEY TO NEW GUINEA SPECIES OF CERATOPOGON

1. Wing with veins R₁ & Rs completely fused, without both radial cells..... 2

1. Contribution from the Laboratory of Entomology, Kyoto Prefectural University, No. 92.

- Wing with veins R_1 & R_s not completely fused, with 1 or 2 radial cells although sometimes obscure..... 3
2. Femora of 3 pairs of legs different in color from each other: fore almost entirely white, mid brown on basal 1/2 and white on apical 1/2, hind femur almost entirely brown **petersi**
Femora of 3 pairs of legs similarly and uniformly dark brown..... **novaguineae**
3. Wing with veins R_1 & R_s separated by 2 distinct or slit-like radial cells **papuensis**
Wing with veins R_1 & R_s partially fused forming only a single radial cell 4
4. Maxillary palpus 5-segmented; wing with 1st radial cell only.. **maai**
Maxillary palpus only 3-segmented; wing with 2nd radial cell only **fuscipennis**

1. **Ceratopogon petersi** Tokunaga, n. sp. Figs. 1d, h, n; 2d.

Minute dark species; wing with stigma-like dark R_s , legs with dark knees, all tibiae and tarsi almost white, 3 pairs of femora different in color from each other. Wing without both radial cells and macrotrichia, vein M_2 highly reduced. ♀ unknown.

♂: Body 0.82 mm long; wing 0.61×0.22 mm. Head dark on vertex, brown on frons; eyes pubescent, separated as wide as 2 facets. Mouth parts almost white; palp (fig. 1h) white, RL-P 25 : 4.5 : 9 : 5 : 3 : 5.5, III oval, with sensory pore beyond middle. Antenna (fig. 1d) with I dark brown, II & XI–XIV slightly fuscous, III–IV very slightly brownish, V–X almost white, plumose hairs very pale brown; III–V somewhat fused with each other; CRL of II–XI to XII–XIV 69 : 57, RL–13A 16 : 6.5 + 5.5 + 5 : 5.5 : 5.7 : 5.9 : 6 : 6 : 5.5 : 23.5 : 16 : 17.4.

Thorax entirely dark brown; scutum with 3 supra-alar setae, scutellum with 2 median and 2 lateral setae. Legs with knees dark, tarsi almost white, but hind basitarsus slightly brownish; in fore leg, coxa to femur white, but basal end of lateral side of coxa brownish; in mid, coxa dark, trochanter pale brown, femur brownish on basal 1/2, white on apical 1/2, excepting dark tip; in hind, coxa and trochanter as in mid, femur largely brown, excepting only pale brown base. Tarsal segment IV of fore and mid legs flattened, bell-shaped, but hind subcylindrical; claws small, equal, cleft at extreme apices, hind tibial comb with 5–6 apical bristles. TR and RL-L 1.8 and 60 : 60 : 26 : 14.5 : 9 : 6 : 7.3 in fore, 2.32 and 76 : 67 : 44 : 19 : 10 : 5.5 : 7 in mid, 2.19 and 69.5 : 62 : 35 : 16 : 9 : 5 : 8 in hind. Wing (fig. 1n) with anterior veins dark, without macrotrichia and both radial cells, vein M_2 largely atrophied, costa ending slightly beyond tip of Cu_1 , CR 0.58, RL-V 16 : 14 : 18.5 : 0 : 5, r-m about 3/4 of R_s (15 : 20), fMCu under base of r-m. Halter with base dark, knob white.

Abdomen with tergites brown, pleural membranes dark, caudal segments dark brown. Hypopygium (fig. 2d) with tergite thickened only along lateral margins, without prominent anal points; coxite conical, style slender, slightly curved, shorter than coxite (16.5 : 20); aedeagus rather broad, round at tip; parameres separated, tape-like, pointed at apices, coiled at basal parts, with strongly thickened bases.

Holotype ♂ (BISHOP 3625), Bainyik, Sepik Distr., NE New Guinea, light trap, III. 1959, Peters.

DISTRIBUTION: NE New Guinea.

This is closely allied to *C. insulicolus* Tokunaga from Yap I. of Carolines, but from

which it may be rather easily distinguished by the characteristic color of legs.

2. **Ceratopogon novaguineae** Tokunaga, n. sp. Figs. 1e, f, i, j, o, p; 2e, i.

Minute dark brown species; wing with stigma-like brown Rs, legs with dark knees, all femora dark brown to brown, tibia brown, tarsi largely white, 3 pairs of legs similar in

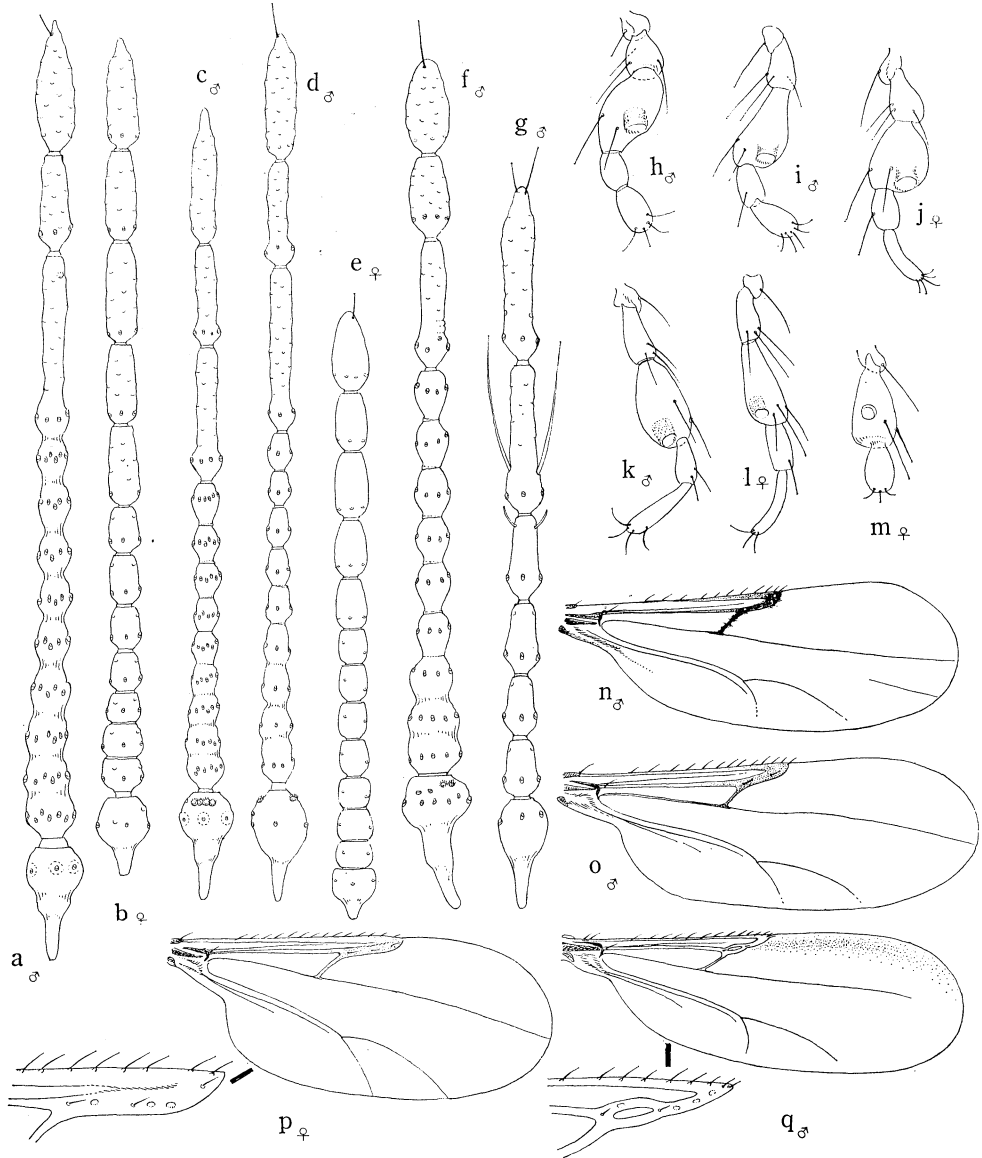


Fig. 1. *Ceratopogon* spp. a-g, antennae, scapes and hairs omitted; h-m, maxillary palpi; n-q, wings, fringes omitted, and parts of radial cells. d, h, n, *petersi*; e, f, i, j, o, p, *novaguineae*; b, c, l, *papuensis*; a, k, q, *maai*; g, m, *fuscipennis*.

color to each other. Wing without both radial cells, vein M_2 and macrotrichia.

♀. Body 1.05 mm long; wing 0.6×0.27 mm. Head dark brown, frons and mouth parts brown; eyes pubescent and just contiguous. Palp (fig. 1j) 5-segmented (3 : 7 : 8.2×6.5 : 5 : 7), III short-oval, with rather large sensory pore on apical part; mandible with 8 cutting teeth. Antenna (fig. 1e) with I dark, other segments entirely brown, II-III discoidal, IV-V spherical, VI-IX short-oval, X-XIV oval; AR 1.09, RL-A 12 : 6.5 : 3.5×4.7 : 4 : 3.8×4 : 4.2×3.5 : 4.5 : 4.5 : 4.5 : 6.5 : 6.5 : 8 : 7 : 9.

Thorax entirely dark brown; scutum with 5 supra-alar setae, scutellum with 2 median and 2 lateral setae. Legs with knees dark, coxae to femora uniformly dark brown or brown, tibiae brown or pale brown, tarsi white, but bases of tarsal segments and last tarsal segments somewhat brownish; hind tibial comb with 8 apical bristles; claws slender, slightly shorter than last tarsal segments, somewhat unequal, each with small basal barb. TR and RL-L 1.74 and 62 : 61 : 20 : 11.5 : 9 : 6.5 : 12 in fore, 1.76 and 74 : 66 : 30 : 17 : 12 : 8 : 14.7 in mid, 2.5 and 70 : 61 : 35 : 14 : 11 : 8 : 15.2 in hind. Wing (fig. 1p) with brown stigma-like Rs, without both radial cells, vein M_2 and macrotrichia; costa ending far before tip of M_{3+4} , CR 0.61, Rs thickened, RL-V 16 : 14.5 : 19 : 0 : 8, r-m 0.58 of Rs (18 : 31), fMCu under base of r-m, Cu_1 almost straight. Halter with base brown, knob white.

Abdomen with tergites brown, other parts very pale brown, cercus brown; spermatheca (fig. 2i) single, dark brown, short-oval ($0.7+16 \times 12$), with very short chitinized part of duct.

♂. Body 1.07 mm long; wing 0.69×0.26 mm. General color as in ♀, but tibiae of all legs dark brown as in femora, stigmal area of wing paler than in ♀. Head with eyes pubescent, separated as wide as 2 facets. Palp (fig. 1i) with 5 segments 3 : 7 : 11.3×5.5 : 5.5 : 6.5 in RL, III longer than in ♀. Antenna (fig. 1f) with I dark brown, other segments and plumose hairs brown; III-IV fused with each other; CRL of II-XI to XII-XIV 75 : 43, RL-13A 14 : $16(5+5+6) \times 8-6$: 7×5 : 7 : 7 : 7 : 7 : 19 : 11.5 : 12.5.

Legs with coxae to tibiae dark brown, tarsi almost white; hind tibial comb with 6 apical bristles; claws small, equal, cleft at extreme tips. TR and RL-L 1.73 and 67 : 64 : 22 : 12.7 : 11 : 8.5 : 11.5 in fore, 1.64 and 80 : 68 : 32 : 19.5 : 15 : 9 : 11 in mid, 2.0 and 75 : 68 : 34 : 17 : 15.4 : 9.7 : 11.5 in hind. Wing (fig. 1o) generally as in ♀; costa ending above tip of Cu_1 , CR 0.55, RL-V 17 : 15.7 : 22 : 0 : 6, r-m 0.55, of Rs (14 : 24), fMCu under mid of Rs.

Abdomen with tergites brown or dark brown, pleural membranes pale fuscous, sternites almost white. Hypopygium (fig. 2e) dark brown; tergite with subsquare chitinized thickening; coxite somewhat oval, style rather small, about $2/3$ as long as coxite (14.5 : 21.5), sharply pointed, beak-like; aedeagus subtriangular, with tip blunt, basal arms large; parameres fused forming broad median plate, apical part with paired filiform projections, basal roots slender.

Holotype ♀ (BISHOP 3626), Bubia, nr. Lae, NE New Guinea, 18-25.III.1959, Ardley. Allotype ♂, Lowlands Agr. Stat., Keravat, New Britain, light trap, 22-26.VIII.1960, Smee. Paratypes: 1♀, 1♂ with holotype; 1♀, 3♂♂ with allotype; 1♂, Keravat, New Britain, light trap, 13-17.VI.1960, Smee.

DISTRIBUTION: NE New Guinea and New Britain.

This is allied to the Micronesian *C. insulicolus* Tokunaga, from which it is distinct by the uniformly dark brown or brown tibiae (not yellowish on apical parts), almost straight Cu_1 (not curved), and short-oval spermatheca (not elongate-pyriform).

3. *Ceratopogon papuensis* Tokunaga, n. sp. Figs. 1b, c, 1; 2a, b, f, j.

Minute dark brown species; wing with R_1 and R_s , but both radial cells obscure and ill-defined, M_2 atrophied on basal part; ♀ antenna with III–V segmented but closely applied; ♂ antenna with III–VI somewhat fused with each other.

♀. Body 0.98 mm long; wing 0.82×0.34 mm. Head dark brown, with frons pale brown; eyes distinctly pubescent, separated as wide as 4 facets. Mouth parts dark brown or brown; mandible with 9 cutting teeth; palp (fig. 11) 5-segmented (4 : 9 : 13×6 : 8 : 10.5), III with distinct sensory pore on apical part, V slender. Antenna (fig. 1b) entirely dark brown, 14-segmented but III–V very closely applied, somewhat discoidal, VI–IX short-oval, X–XIV subcylindrical; AR 1.37, RL-A 16 : 11 : 5×6.5 : 4.7 : 4.5 : 5×4.8 : 5.8×4.8 : 6 : 6 : 11.8×5 : 11 : 14 : 13.7 : 16.

Thorax entirely dark brown; scutum with 5–6 supra-alar setae, scutellum with 3 setae. Legs largely dark brown, but with knees black, tarsi somewhat paler; hind tibial comb with 6 apical bristles, claws slender, slightly unequal, shorter than last tarsal segment and each with basal barb. TR and RL-L 2.29 and 77 : 79 : 32 : 14 : 10.5 : 8.5 : 14 in fore, 2.33 and 90 : 87 : 49 : 21 : 14 : 8 : 13.5 in mid, 2.71 and 92 : 86 : 46 : 17 : 12 : 9 : 14 in hind. Wing (fig. 2a) with veins brown, membrane pale, pale brown cloud along costal margin of cell R_5 , without macrotrichia; costa ending before apex of M_{3+4} , CR 0.68, both radial cells obsolete or ill-defined, RL-V 25 : 19 : 25 : 5 : 13, r-m shorter than R_s , fMCu under r-m, basal part of M_2 atrophied. Halter entirely dark brown.

Abdomen largely dark brown, pleural membranes fuscous; spermatheca (fig. 2j) single, dark brown, round ($1+16 \times 16$).

♂. Body 1.5 mm long. Wing 0.85×0.3 mm. General color as in ♀, but tarsal segments of all legs and wings paler. Eyes separated as wide as 3 facets. Palp 5-segmented (3.5 : 8.5 : 14.5×7 : 7 : 12), III oval, with sensory pore as in ♀. Antenna (fig. 1c) with III–VI fused, plumose hairs normal, CRL of II–XI to XII–XIV 73 : 85, RL-8A 7 : 7 : 7.5 : 8 : 8.5 : 25 : 20 : 26.5.

Scutum with 6–7 supra-alar setae, scutellum with 4 setae. Legs with tarsi paler than basal segments; hind tibial comb with 5 apical bristles, claws small, equal, cleft at extreme apices. TR and RL-L 1.69 and 82 : 84.5 : 33 : 19.5 : 14.5 : 7 : 9.5 in fore, 1.91 and 93 : 89 : 52.5 : 27.5 : 20.5 : 8.5 : 9 in mid, 2.35 and 96 : 89 : 47 : 20 : 16 : 8 : 10.5 in hind. Wing without costal brownish cloud, costa ending slightly beyond tip of Cu_1 , CR 0.59, RL-V 23 : 19 : 26 : 4 : 8.5, fMCu under base of r-m, r-m longer than R_s (fig. 2b).

Abdomen entirely dark brown. Hypopygium (fig. 2f) with anal points drum-stick-like; coxite rather short, only just longer than style (22 : 20); style very slightly curved and tapered; aedeagus elongate, as long as coxite, with apical part rather broadened, with minute terminal point, basal arms small; parameres fused, somewhat H-shaped, with caudal lobes flattened vertically, apodemes elongate.

Holotype ♀ (BISHOP 3627), Kwiena, nr. Minj, NE New Guinea, light trap, 11. V. 1959, Peters. Allotype ♂, Rain forest, 15 m, 3.6 km NW of Lae, NE New Guinea, 9. VII. 1957,

Hardy. Paratype ♀ with holotype.

DISTRIBUTION: NE New Guinea.

This is closely allied to *C. (Brachypogon) corius* de Meillon & Wirth. However, the structures of the ♂ hypopygia of the 2 species differ in the following points: in the pre-

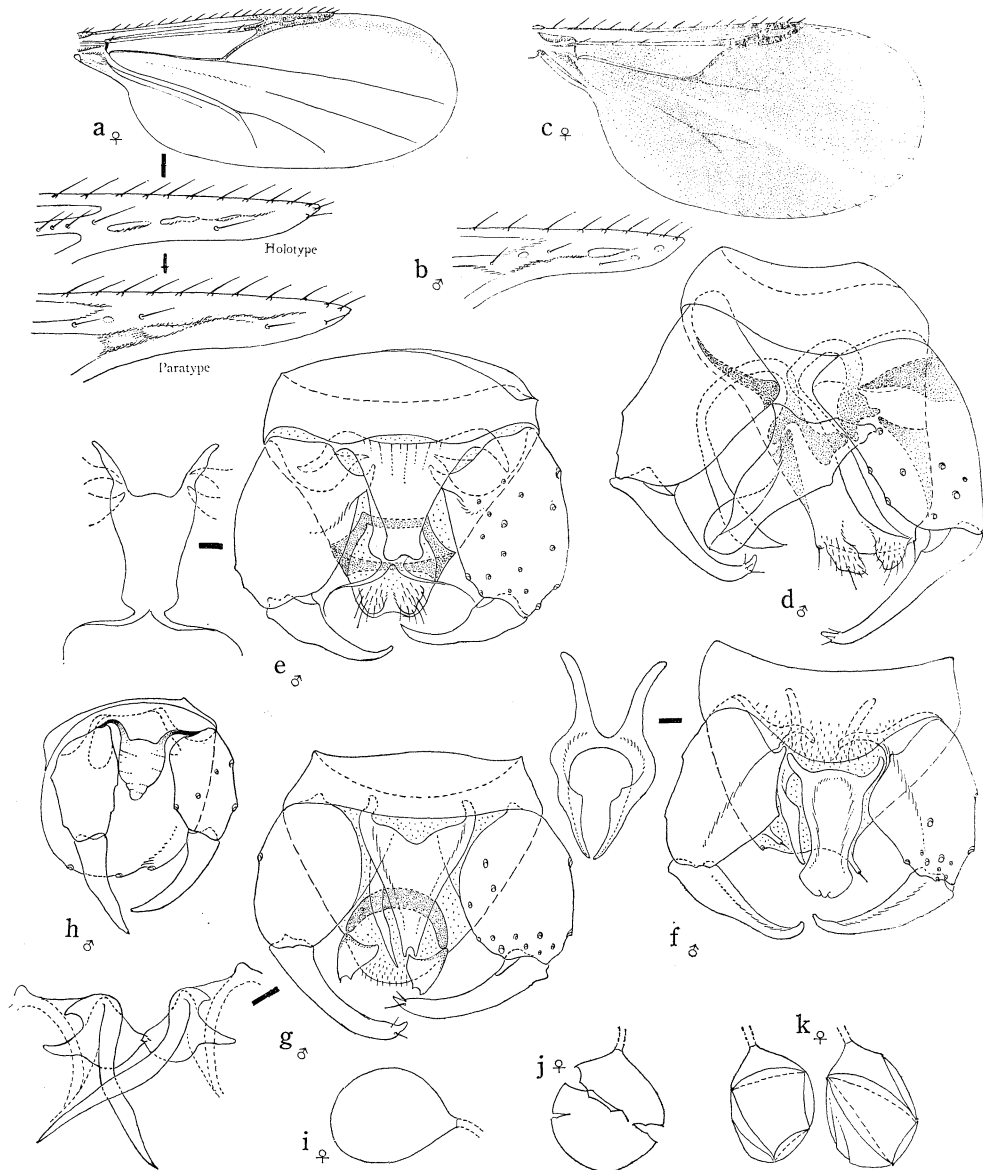


Fig. 2. *Ceratopogon* spp. a-c, wings, fringes omitted, and with parts of radial cells; d-h, hypopygia of ♂♂, sternal aspect, and parameres; i-k, spermathecae of ♀♀. a, b, f, j, *papuensis*; c, h, k, *fuscipennis*; d, *petersi*; e, i, *novaguineae*; g, *maai*.

sent species, anal points prominent, aedeagus not gradually tapered but somewhat broadened apically, parameres not extending in parallel position but caudal lobes curved and convergent forming a shape like a heart and apodemes longer and divergent, differing from the allied African species.

4. **Ceratopogon maai** Tokunaga, n. sp. Figs. 1a, k, q; 2g.

Minute brown species; wing with single radial cell, 2nd cell being absent, vein M_2 completely atrophied, macrotrichia absent. ♀ unknown.

♂. Body 1.01 mm long; wing 0.72×0.27 mm. Head dark brown, with frons and mouth parts brown; eyes entirely pubescent, separated as wide as 5 facets. Palp (fig. 1k) 5-segmented (4 : 8 : 12×7 : 7 : 11), III oval, with distinct sensory pore on apical part, V slender. Antenna (fig. 1a) with I dark, other segments and plumose hairs entirely brown; III–XII not distinctly segmented but more or less fused with each other; CRL of II–XI to XII–XIV 74 : 57, RL–8A 6 : 6.5 : 6.5 : 6 : 7 : 26 : 13 : 17.

Thorax entirely brown; scutum with 5 supra-alar setae, scutellum with 2 median and 2 lateral setae. Legs entirely brown; hind tibial comb with 5 apical bristles, claws cleft at extreme tips. TR and RL-L 1.73 and 66 : 68 : 26 : 15 : 11.8 : 7 : 10 in fore, 1.88 and 80.5 : 77.5 : 39.5 : 21 : 15.5 : 8.5 : 10 in mid, 2.32 and 73.5 : 72.5 : 39.5 : 17 : 15 : 8.5 : 10 in hind. Wing (fig. 1q) with faint brownish cloud along costal margin of cell R_5 , veins pale brown; veins R_1 and R_s fused apically beyond 1st radial cell, M_2 and macrotrichia completely absent; costa ending far beyond tip of Cu_1 , CR 0.56 (31 : 55.5), RL-V 18 : 15 : 22 : ? : 7, r-m shorter than R_s (20 : 26), 1st radial cell elongate-oval, slightly shorter than apical part of R_s (12 : 14), fMCu under radial cell, Cu_1 strongly curved. Halter with base brown, knob very pale.

Abdomen with tergites brown, other parts pale. Hypopygium (fig. 2g) brown; tergite with paired subtriangular caudal lobes and lunula-shaped thickening; coxite short-oval, style large, as long as coxite (20 : 21), almost uniformly thickened; aedeagus elongate-triangular, with basal arms very short; parameres separated, as long as style (20 : 20), sharply pointed, slightly curved, with basal apodemes rather large.

Holotype ♂ (BISHOP 3628), Waris, 450–500 m, S of Hollandia, NW New Guinea, 1–7. VIII. 1959, Maa, at light. Paratype ♂ with type.

DISTRIBUTION: NW New Guinea.

This is somewhat allied to *C. (Fanthamia) adulator* de Meillon from Zululand in the structure of the ♂ hypopygium and the absence of the 2nd radial cell of the wing. But the allied African species is distinctly different from the New Guinea species in the presence of the wing macrotrichia, vein M_2 and prominent black spot covering the 1st radial cell.

5. **Ceratopogon fuscipennis** Tokunaga, n. sp. Figs. 1 g, m; 2 c, h, k.

Minute whitish species; wing broadly fuscous on middle part, with only 1 radial cell, 1st cell being completely absent, vein M_2 completely atrophied; palp only 3-segmented; ♀ with 2 spermathecae; ♂ with 8-segmented antenna and without distinct lobes of parameres of hypopygium.

♀. Body 0.87 mm long; wing 0.54×0.25 mm. Head brown, with frons pale ochreous, mouth parts white; eyes distinctly pubescent, just contiguous. Palp (fig. 1m) 3-segmented ($3 : 9 \times 5.5 : 5$), II with sensory pore at middle. Antenna normal, I brown, other segments pale brown, III-IX oval, X-XIV elongate-oval; AR 0.8, RL-8A $5 : 5.5 : 5.7 : 6 : 6.2 : 7.7 : 8.5 : 9.2$.

Thorax yellow and brown, scutum brown, with paired yellowish ill-defined stripes along foveae, supra-alar setae 2; scutellum yellow, with lateral corners brown, 2 setae on middle and 2 on lateral parts; pleura and sternum yellow. Legs entirely pale brown and almost white; hind tibial comb with 7 apical bristles, claws simple, small, equal. TR and RL-L 2.63 and $53 : 49 : 21 : 8 : 7 : 6 : 8.5$ in fore, 3.5 and $57 : 56 : 28 : 8 : 7 : 6 : 8.5$ in middle, 3.86 and $61 : 54 : 27 : 7 : 7 : 6 : 8$ in hind. Wing (fig. 2c) short-oval, broadly fuscous on mid part, with macrotrichia very sparsely arranged close along margin of apical $1/2$, veins M_2 , Cu_2 and 1A completely absent, M_1 and 2 branches of fMCu very faint and highly reduced, costa ending before tip of M_{3+4} , CR 0.66, 1st radial cell absent, 2nd subtriangular, slightly shorter than its stem vein ($12 : 14$), r-m as long as R_1 , RL-V $60 : 54 : 63 : 16 : 31$, fMCu under r-m. Halter white.

Abdomen very pale ochreous, but pleural membranes slightly fuscous, 2 caudal segments pale brown; cerci very pale, spermathecae (fig. 2k) 2, subequal, yellowish ochreous, short oval.

♂. Body 0.92 mm long; wing 0.44×0.22 mm. General color as in ♀. Eyes pubescent, linearly separated. Palp 3-segmented ($2.5 : 9 \times 5.4 : 4$) as in ♀. Antenna (fig. 1g) only 8-segmented, with RL $15 \times 18 : 13 : 7 : 6.5 : 7.5 : 9 : 17 : 18$, I brown, other segments pale brown, plumose hairs highly reduced.

Thoracic structure as in ♀. Legs entirely white; hind tibial comb with 4-6 apical bristles; claws slender, simple, equal. TR and RL-L 2.9 and $48 : 44 : 18 : 6.2 : 6 : 5.5 : 8$ in fore, 3.2 and $52 : 47 : 24 : 7.5 : 6 : 6 : 8$ in mid, 3.83 and $53 : 43 : 23 : 6 : 6 : 5.8 : 8$ in hind. Wing as in ♀, but basal $1/2$ paler, without macrotrichia, branches of vein M and other posterior veins highly reduced and invisible. CR 0.62, RL-V $44 : 40 : ? : 10 : 21$, 2nd radial cell just longer than its stem vein ($10 : 9$) and shorter than r-m ($10 : 11$).

Abdomen almost uniformly white. Hypopygium (fig. 2h) very pale brown; tergite broad; coxite small, style slender, as long as coxite; aedeagus small, membranous, with basal arms slender; lobes of parameres invisible.

Holotype ♀ (BISHOP 3629), Kavieng, New Ireland, 3.VI.1959, light trap, Peters. Allotype ♂ with holotype. Paratype ♂, Maprik, Sepik Distr., NE New Guinea, I. 1959, Peters.

DISTRIBUTION: NE New Guinea and New Ireland.

This species is quite special for members of *Ceratopogon* (sen. lat.) in the structures of wing, reduced maxillary palpi, 8-segmented antenna of ♂ and paired spermathecae of ♀. These characters are thought to suggest that the species represents a new group of the genus.