

Notes On Biting Midges From Japan And Korea (Heleidae or Ceratopogonidae, Diptera)

By

MASAAKI TOKUNAGA

Recently H. R. Bullock and S. Kitaoka sent me a small collection of biting midges from South Korea and Tokyo respectively. These biting midges were collected by light trap at night and Bullock's collection consists *Culicoides circumscriptus* KIEFFER (5), *C. pulicaris* LINNAEUS var. *ocellaris* KIEFFER (4), *C. arakawae* ARAKAWA (4), *C. odibilis* AUSTEN (1), *C. nipponense* TOKUNAGA (2), and *C. odiatus* Austen (1) and Kitaoka's collection consists of *C. sigaensis* TOKUNAGA (5), *C. oxystoma* KIEFFER (3), *C. arakawae* ARAKAWA (5), *C. kibunensis* TOKUNAGA (1), *C. kitaokai* TOKUNAGA (1), *C. nipponense* TOKUNAGA (1), two species of *Lasiohelea* and several species of *Forcipomyia*. Of these species *C. nipponense* and *C. kitaokai* are new to science, and *C. odibilis* and *C. odistus* are new to record in Japan and Korea. I have to acknowledge indebtedness to Dr. HOWARD R. BULLOCK of 498th Medical Company of U. S. A., Dr. SHIGEO KITAOKA of Veterinary Experiment Station of Tokyo and Mr. YUKIO SHOGAKI of Far East Medical Research Unit of U. S. A., each of whom has presented materials for my examination. I am also deeply thanking to Mr. MITSUHIRO SASAKAWA and Mrs. ETSUKO MURACHI for the preparation of this paper.

Abbreviation, measurement and method: AR is used to express the ratio of the total length of the distal five elongated segments of female antenna to that of basal eight segments 2-9. TR is used to express the ratio of the length of the first to the second tarsal segment. 30 units of measurement are 0.1 mm. The length of the wing is measured from the axillary incision (between squama and alula) to the tip. Specific

characters mainly were observed on the specimens mounted in Gater's solution, except for the descriptions specially noted. Specimens examined are deposited in the entomological laboratory of Saikyo University.

1. *Culicoides odibilis* AUSTEN

Culicoides odibilis AUSTEN, 1921. Bull. Ent. Res., 12: 114.

C. winnertzi EDWARDS, 1926. Trans. Ent. Soc. London, 1926: 406.

C. pictipennis WINNERTZ (*nec* Steager), 1825. Linn. Ent., 6.

C. odibilis, EDWARDS, 1939. British Blood Sucking Flies, 37 and 136.

A rather large and brownish gray pruinose species and scutum with dark brown pattern in dry state; legs brown, with yellowish rings before and beyond dark knee-joints; wings entirely hairy, dark and with many small round and oval pale spots, second radial cell enveloped in second costal dark spot, cell M_1 with two pale spots: one on each end; halteres brown.

Female. - Body length 2.0-2.35 mm. Wings 1.45-1.68 mm. by 0.6-0.63 mm.

Head brown, with eyes very narrowly separated from each other above as wide as half a facet and with two setae between eyes; clypeus with two pairs of setae. Maxillary palpi brown, third segment oval, large, with a very large sensory pore on distal half, five segments in proportion of 6.5:22.5:27.5:10:11. Antennae with scapes dark brown, basal short flagellar segments yellow and each distal end pale brown, distal five long segments brown, ultimate segment without terminal stylet and ending into a

blunt tip ; third antennal segment about 1.5 times as long as width, distal segments gradually narrowed and elongated and ninth segment about twice as long as width ; distal nine segments in proportion of 11 : 11.5 : 12 : 12 : 26 : 27 : 30.5 : 30.3 : 40.8.

Thorax uniformly brown, but in dry state scutum brownish gray pruinose and with dark brown pattern, this pattern rather distinct in Korean specimen but very much obscure and subconfluent in Japanese specimen ; scutal dark brown spots : a short T-shaped spot on cephalic margin, one pair of oval spots on black humeral pits, one pair of large lateral vittae laterad of foveae, a short slender stripe at middle of mid-dorsal line, a pair of short stripes on caudo-scutal area and an oval spot along caudal margin of scutum ; scutellum with two lateral and two median long bristles and several small accessory setae. Legs mainly brown, with knee-joints dark brown, tarsi paler on distal segments, fore and middle femora each with a pre-apical yellowish pale brown ring and all tibiae each with a sub-basal yellow ring ; segments of legs, except for basal two, in proportion of 135 : 129.5 : 62.5 : 28.5 : 19 : 13.5 : 14 in fore, 163 : 165.5 : 86.5 : 31 : 20 : 13.5 : 14.8 in middle and 157 : 160 : 74 : 38.5 : 22.5 : 14 : 14.5 in hind leg.

Wings entirely hairy, except for basal cell ; membrane dark gray and with many small round or oval pale spots : basal spot round, covering arculus and bases of R and M, first costal spot longer than width, arising from costa and enveloping r-m and adjacent parts of related veins, second spot similar in shape to first, longer than width, not enveloping R₄₊₅ and ending before M₁, third costal spot somewhat oval or semicircular and at distal corner of cell R₅, cell M₁ with an oval spot at base and an oval spot at distal end closely touching to wing margin, cell M₂ with a semicircular spot along distal margin, cell M₄ with a large subtriangular spot on distal half, anal cell with a large elongate subtriangular spot on basal corner, a small round spot under tip of stem of fMCu and a large oval spot along wing margin before Cu₁, a small

oval spot above basal one-third of stem of fMCu, a small oval spot just above fMCu, a very long pale spot under M₁₊₂ and basal one third of M₂, an oval spot under second costal pale spot covering a part of M₁ ; venation : R₁ ending just beyond level of tip Cu₁, R₄₊₅ ending midway of wing margin between tips of Cu₁ and M₃₊₄, first radial cell as long as second cell, forking point of M₁₊₂ at level of fMCu and under middle of first radial cell. Halteres brown.

Abdomen mainly pale brown, sternites and tergites brown ; cerci brown ; spermathecae : two spherical, brown, slightly unequal and each with a short brown duct, one minute, brown and claviform, common duct with a chitinized ring.

Male. - Unknown from Japan and Korea.

Specimens. - A female ; Midoro-ike, Kyoto ; July 25, 1952 (Shogaki, by light trap) ; a female ; Youngsung, South Korea ; May 25, 1954 (Bullock, by light trap).

This species is thought to distribute widely in Palaearctic region but the number of individuals is not abundant. The wing markings of both specimens examined are practically quite identical to the figure shown by Dr. F. W. Edwards (1939, British Blood Sucking Flies, London. Fig 8), excepting following slight differences : in Korean specimen the apical pale spot of cell R₅ is somewhat larger and oval rather than semicircular and the apical pale spot of cell M₂ is not so closely touching to wing margin as in British specimen and in Japanese specimen the basal pale spot of cell M₁ is somewhat smaller and two lines along both sides of the distal three-fourths of M₁ are paler. These differences seem to represent some of local variations.

2. *Culicoides sigaensis* TOKUNAGA

Culicoides sigaensis TOKUNAGA, 1937. Tenthredo, 1 : 322-324.

This species is rather common in Japan and known from Kyushu, Honshu and Hokkaido, but there is no exact description on the male sex and here I intend to point out the allotype of

this species with its description.

Male.—Body length 1.8–2.0 mm. Wings about 1.3 mm. by 0.5 mm. Generally as in female with usual sexual differences.

Head brown, with eyes just touching above to each other; clypeus with two pairs of setae. Maxillary palpi brown, third segment somewhat oval and with a small sensory pore before distal end; five segments in proportion of 5 : 12 : 13 : 6 : 10. Antennae with scapes dark brown, second and distal three segments brown, short flagellar segments 3–11 and their plumose hairs pale brown; relative lengths of distal eight segments about 10 : 11 : 11 : 10 : 10 : 35 : 30 : 34; combined lengths of segments 2–11 and 12–14 in proportion of 139 : 101.

Thorax almost uniformly brown; scutum with a pair of oval yellowish spots on humeral pits; scutellum with only single median bristle. Legs mainly brown, but bases of all femora pale brown, in fore and middle legs femora and tibiae with yellowish rings before and beyond dark knee-joints, hind tibia with a sub-basal and an apical yellow band; relative lengths of leg segments, except for basal two segments, about 113 : 113 : 62 : 25 : 16 : 11.5 : 12 in fore, 139 : 139 : 80 : 31 : 17.5 : 11 : 12 in middle and 134 : 132 : 64 : 32 : 17 : 13 : 13 in hind leg.

Wings with macrotrichia very sparse, only being found in a line along wing margin of cell R_5 and several in anterior distal corner of cell M_1 ; venation: R_1 ending at level of tip of Cu_1 , R_{4+5} ending at level of middle between tips of Cu_1 and M_{3+4} , fM_{1+2} just before middle of first radial cell, $fMCu$ under tip of first radial cell and slightly beyond middle of wing length; wing pattern: closely as in Tokunaga's figure (1937. *Tenthredo*, 1, Plate 28, Fig. 19), but slightly differing in the following points: second costal dark band more widely expanded caudad in cell R_5 and third costal dark band broader but narrower than second.

Hypopygium (Fig. 3) brown, with ninth tergite somewhat trapezoid, posteriorly narrowed and truncated, shorter than basal width (25 : 45) and without anal points; ninth sternite

very short, narrowly transverse, with very shallow and wide V-shaped caudal incision and with caudal membrane quite bare; coxite slender and slightly curved; style arcuate, basal half brown and pubescent, distal half not pubescent, yellow or hyaline and slightly swollen apically; aedeagus elongate, triangular, shorter than twice of basal width (30 : 17), apical one-fourth slender and slightly clavate; parameres yellow or yellowish, basally contiguous with each other, basal one-fourth somewhat pointed at tip, apical three-fourths divergent, gradually taper and curved ventrad and ending into very slender apices.

Allotype.—Male; Kodaira—Machi, Kita-Tama-Gun, Tokyo-To; Oct. 28, 1954 (Kitaoka, by light trap). *Paratype*.—A male with allotype.

3. *Culicoides odiatus* AUSTEN

Culicoides odiatus AUSTEN, 1921. Bull. Ent. Res., 12 : 112.

C. pallidicornis KIEFFER var. *bruneoscutellatus* CEZA ZILAHİ, 1934. Bull. Soc. Ent. Bulg., 8 : 155.

C. odiatus, EDWARDS, 1939. Brit. Blood Sucking Flies, 40 and 138.

A small brownish and gray pruinose species and scutum with dark brown subconfluent pattern in dry state; scutellum with many setae; legs mainly brown and with yellow rings before and beyond dark brown knee-joints; wings entirely hairy, except for basal cell, gray on membrane and with two obscure pale spots very much faint; halteres white.

Female.—Body about 1.63 mm. long. Wings about 1.26 mm. by 0.56 mm.

Head brown, with eyes very narrowly separated above as wide as half a facet; clypeus with four pairs of setae. Maxillary palpi brown; third segment large and with a very large sensory pore on distal half; five palpal segments in proportion of 5 : 12.5 : 22.5 : 8 : 9.5. Antennae with scapes reddish brown, other segments brown but basal half of each segment from third to ninth paler; third antennal segment

slightly shorter than width (7:8), distal segments gradually elongated and narrowed, ninth segment slightly longer than width (8:7), last segment ending into blunt tip and without terminal stylet; AR about 1.7; distal nine segments in proportion of 7.5:8:8:8:22:21:23:23:31.

Thorax almost entirely brown, except for a pale yellow oval spots covering humeral pits, but in dry state scutum brownish pruinose on cephalic half and gray pruinose on caudal half and with dark brown subconfluent marking; humeral pits dark, a median longitudinal stripe slender, expanding at middle forming a small rhombic spot and expanding again at caudal end forming a triangular spot along scutellum, a pair of rather broad vittae along foveae, each expanding laterad at middle part forming an anterior small and a posterior large triangle, a pair of narrow stripes along lateral margins of posterior two-thirds and these lateral stripes confluent with paired vittae at lateral points of posterior large triangular spots; scutellum brownish pruinose in dry state, with two pairs of lateral and a pair of median long bristles and three pairs of small accessory setae between median and second lateral bristles; postscutellum dark brown in dry state. Legs mainly brown, trochanters and bases of femora of all legs pale brown, fore and middle femora broadly yellow before dark brown knee-joints, tibiae of all legs each with a yellow sub-basal band and in middle and hind legs each tibia with a yellowish or pale brown band on distal end, tarsi pale brown; leg segments, except for basal two segments, 102:107:53:24:16:11.5:13 in fore, 132:131:71:24.5:16:11.5:13 in middle and 123:127:58:30:19.5:12:14 in hind leg.

Wings densely hairy all over surface, excepting basal cell between R and M; venation: R₁ ending slightly beyond tip of Cu₁, R₄₊₅ ending beyond midway between ends of Cu₁ and M₃₊₄, fMCu just beyond origin of r-m crossvein and beyond middle point of wing, first radial cell narrowly oval and as long as second cell; wing membrane gray and with two obscure pale

spots: first costal pale spot longer than width and enveloping r-m, basal one-third of first radial cell, tips of R and M and base of M₁₊₂, second costal pale spot short, somewhat semi-circular and as wide as first spot; a round pale spot before fMCu under end part of stem of fMCu very faint, other pale spots practically absent. Halteres white.

Abdomen pale brown, but caudal segments more brownish; cerci yellow, each with caudal margin brownish; spermathecae: two brown, oval (15×12), equal and each with a very short yellow duct, one minute, brown and clavate; common duct with a brown chitinized ring which is shorter than width.

Male. - Unknown from Japan and Korea.

Specimen. - A female; Youngsung, South Korea; June 9, 1954 (Bullock, by light trap).

This species is provided with wings very closely similar to those of *C. kibunensis* TOKUNAGA (1937. Tenthredo, 1: 298-301, Plate 25, Fig. 7), but distinctly differing in the following points: AR is larger being about 1.7 and the position of fMCu is slightly beyond the middle point of the wing, while in the allied species AR is only at most 1.4 and the position of fMCu slightly before the middle point of the wing.

4. *Culicoides nipponense* sp. nov.

A rather large and brownish gray species and scutum with dark brown to black pattern in dry state; legs brown, with yellow bands and yellow tarsi; wings extensively dark, with small oval and round pale spots, closely similar to those of Formosan specimens of *C. peregrinus* KIEFFER; halteres brown.

Female. - Body length 1.9-2.0 mm. Wings about 1.3 mm. by 0.5-0.6 mm.

Head dark brown, with eyes bare and contiguous above to each other as long as a facet; clypeus with two pairs of long setae. Maxillary palpi dark brown; third segment with scattered sensillae on ventral side of distal half; five segments in proportion of 5:17:20:9:10. Antennae with scapes dark brown; segments

2-9 yellow but their apical ends pale brown; segments 10-14 brown but their bases yellowish pale brown; AR about 1.11; proportional lengths of distal nine segments about 12:11.5:11.3:12:17:18.8:19:22.5:30.5.

Thorax in dry state brownish gray and pruinose and scutum with dark brown or black pattern: anterior and lateral margins of scutum dark brown, slender brown stripes along foveae, a pair of distinct black spots on caudoscuteal area and dark brown along scutellar margin, scutellum brownish gray and postscutellum black; in alcoholic and mounted specimens thorax almost uniformly dark brown and scutum with brown subconfluent pattern: a pair of small spots on humeral pits, a pair of longitudinal vittae on middle of caudal three-fourths between foveae, two obscure subconfluent spots on each lateral area; scutellum and postscutellum brown or dark brown; scutellum with a pair of lateral and two median long bristles and a few small accessory setae. Legs mainly brown and with yellow tarsi and yellow bands; fore leg with yellow bands before and beyond dark knee-joint, trochanter and base of femur yellow and in some specimen tip of tibia yellow, middle leg with knee-part broadly yellow and base of femur narrowly yellow, hind femur and tibia with bases more or less yellow and ends of tibia also yellow. Leg segments, except for basal two, in proportion of 113:113.5:59.5:24:16.5:12:15 in fore, 135:143.3:67.5:28:16.5:11.5:15.5 in middle and 131:132.5:69:32.5:19.5:12:17.5 in hind leg.

Wings (Fig. 2) with macrotrichia distributed on distal half of cells R_5 and M_1 and sparsely along marginal areas of cells M_2 , M_4 and anal cell, a line of trichia along each side of distal two-thirds of M_1 and distal half of M_2 ; venation: R_1 ending at level of tip of Cu_1 , R_{4+5} ending at distal one-third of wing length (65:100), first radial cell very narrow and as long as subtriangular second radial cell, $r-m$ almost as long as M_{1+2} , fM_{1+2} and $fMCu$ at middle of wing and slightly beyond tip of first radial cell; membrane extensively fuscous and

with many small oval and round pale spots, pattern closely similar to that of Formosan specimen of *C. peregrinus* KIEFFER (TOKUNAGA, 1937. Tenthredo, 1:305-307, Plate 26, Fig. 11), basal pale spot enveloping arculus and bases of R and M , extending distad between M and stem of $fMCu$ and reaching to level of $r-m$, second costal pale spot rather narrow, its proximal side concave and distal side convex distinctly in V-shape and enveloping $r-m$ and adjacent parts of other veins and in a paratype this costal pale spot subdivided into two by a narrow dark bridge along anterior margin of R and R_1 between first and second costal dark spots, second costal pale spot rather small, enveloping distal half of second radial cell, arising from costal margin and ending before M_1 , third costal pale spot small, somewhat oval or gourd-shaped and situated at distal one-third of cell R_5 being far separated from distal margin of wing, third costal dark spot as broad as second and slightly constricted by second and third pale spots, cell M_1 with a small oval pale spot at middle near by M_2 and a larger oval spot at distal one-third being separated from wing margin, cell M_2 with a small oval spot at opposite position to similar pale spot of cell M_1 and a larger oval pale spot on distal area being separated from wing margin, cell M_4 with a very small round spot on distal corner being separated from margin of the cell and without basal pale spot, anal cell with four or three pale spots: basal one large, obscure, subtriangular and enveloping basal parts of Cu_2 and $1A$, small oval one at basal one-third, just separated from wing margin and subconfluent with basal large spot, small round one at distal one-third under tip of $1A$, small round one at distal one-fourth of the cell, situated closely along wing margin and just before level of $fMCu$, a round pale spot just beneath fM_{1+2} rather large and an oval pale spot just above $fMCu$ rather small and these two spots subconfluent with each other, but in a paratype these two spots highly reduced into very small round or oval spots. Halteres brown or dark brown.

Abdomen brown or reddish brown, with sternites subdivided into paired patches and single small median plates; tergites normal; cerci brown; subanal plate with a pair of long caudal and a pair of small anterior setae; spermathecae: two short-oval or subspherical, brown, very slightly unequal (14.5×14 and 13×12), each with a short chitinized duct, one minute, brown, finger-like and about thrice as long as width, chitinized ring of common duct as long as width or slightly shorter than width.

Male. - Body length about 2.2 mm. Wings about 1.64 mm. by 0.4 mm. Generally as in female except for usual sexual differences. Eyes separated above as wide as two facets from each other. Maxillary palpi with five segments in proportion of 5 : 11 : 20 : 8 : 9. Antennae with scapes dark brown, second and ultimate three segments brown, other short flagellar segments and their plumose hairs all yellow; combined lengths of segments 2-9, 2-10, 2-11, 10-14, 11-14 and 12-14 in proportion of 147 : 162 : 180 : 158 : 143 : 124; distal eight segments in proportion of 14.5 : 14.5 : 14.5 : 14.5 : 18 : 38.5 : 39 : 42.8. Scutellum with a pair of lateral and two median long bristles and a pair of small accessory setae laterad of median bristles. Legs with segments, excepting basal two, in proportion of 144 : 137 : 79 : 35 : 24 : 15 : 16 in fore, 178 : 171 : 92 : 41 : 25 : 14 : 19 in middle and 167 : 159 : 91 : 46 : 32 : 17 : 17 in hind leg. Wings with very sparse macrotrichia which are distributed in two rows along wing margin of cell R_5 , in a line above vein M_1 and a few trichia in anterior distal corner of cell M_1 ; venation: R_{4+5} ending at level of middle of wing margin between tips of Cu_1 and M_{3+4} , first radial cell slightly longer than second cell, $fMCu$ and fM_{1+2} at same level, slightly beyond middle of first radial cell and just before middle of wing length; pattern of pale spots as in female, but a pale spot just above $fMCu$ absent and distal two spots of anal cell confluent. Hypopygium (Fig. 4) brown; ninth tergite broad at basal one-third, somewhat narrowed on distal two-thirds, round on caudal margin, as long as basal width, without lateral anal points, but with

a small median caudal projection; ninth sternite transverse, with a very shallow arcuate caudal incision and without spinules on caudal membrane; coxite with many brown spinules on basal swelling of mesal side; style as long as coxite, evenly arcuate, gradually taper, slightly swollen apically, basal half pubescent and brown but distal half not pubescent and yellow; aedeagus elongate, triangular, twice as long as basal width, basal two-thirds brown and three margins dark brown, two basal points small and slender, apical one-third hyaline, slender and ending into a round tip; parameres rather slender, extending caudad in parallel position, distal two-thirds yellow, slightly swollen and then gradually taper, divergent and curved ventrad and ending into extremely slender sharply pointed tips bearing several very minute spinules.

Holotype. - Female; Kodaira-Machi, Kita-Tama-Gun, Tokyo-To; Oct. 30, 1954 (Kitaoka, by light trap). *Allotype.* - Male; Shichinohe, Aomori-Ken; July 19, 1954 (Kitaoka, by light trap). *Paratypes.* - A female; Yatsushiro, Kumamoto-Ken, Kyushu; Oct. 10, 1942 (Tokunaga, at window of a hotel); two females; Sokcho, South Korea; July 1-3, 1945 (Bullock, by light trap); two females with allotype.

This species is very closely allied to *C. peregrinus* KIEFFER, especially to Formosan specimen, but in the allied species the wing cell M_4 is provided with a distinct pale spot at inner corner of $fMCu$ which is one of specific characters of wing pattern, third costal dark spot is sharply constricted at middle and far narrower than second costal dark spot, two basal pale spots of cells M_1 and M_2 are at least as large as distal ones and TR of female hind leg is less than 2.0 being 1.87, differing from the present species and the male hypopygium is highly specific for each species.

5. *Culicoides kitaokai* sp. nov.

A small brown species; scutum somewhat shining and with subconfluent pale brown pattern; legs mainly brown, with yellowish white

bands; wings dark with subconfluent basal pale spots and distinct apical pale spots, macrotrichia sparsely spread on distal areas of cell R_5 , M_1 and M_2 ; halteres white. Male unknown.

Female.—Body length about 1.9 mm. Wings about 1 mm. by 0.46 mm.

Head dark brown; eyes bare, contiguous above with each other as long as a facet; clypeus with two pairs of long setae; maxillary palpi brown, third segments elongate-oval, with a small sensory pore before tip, five segments in proportion of 4 : 14 : 14 : 7 : 8. Antennae with scapes brown, segments 2–9 yellowish pale brown but distal tip of each segment pale brown, segments 10–14 brown but each base pale brown; AR 1.19–1.20; distal eight segments in proportion of 9 : 9 : 10 : 16 : 17 : 18 : 16 : 26.

Thorax brown, scutum slightly shining, with subconfluent pale brown pattern: a pair of small oval spots on humeral pits, a pair of slender vittae along mesal sides of foveae on cephalic two-thirds, a pair of small vittae along lateral sides of caudoscuteal area, three obscure subconfluent oval spots on each lateral side; scutellum brown and with a pair of lateral and a long median bristle; postscutellum and lateral and sternal sclerites brown; pleural membranes yellowish pale brown. Legs mainly brown, with yellowish bands before and beyond narrowly dark knee-joints, hind tibia broadly yellowish on apical one-third; tarsi pale brown, but first segment of hind tarsus dark brown; leg segments, except for two basal, in proportion of 82 : 82 : 46 : 17 : 11 : 7 : 10 in fore, 105 : 108 : 65 : 19 : 12.5 : 8 : 10 in middle and 104 : 107 : 48 : 22 : 12 : 8 : 9 in hind leg; TR of three paired legs 2.7, 3.4 and 2.18 respectively.

Wings (Fig. 1) with pattern very closely similar to a Japanese common species, *C. sigaensis* TOKUNAGA (1937. *Tenthredo*, 1 : 322–324, Plate 28, Fig. 19); basal pale spot enveloping arculus, extending distad between M and stem of fMCu and continuous with an oval large pale spot between f M_{1+2} and fMCu, second costal pale spot covering r-m cross-vein, tip of R and basal half of first radial cell and its proximal

margin concave in V-shape by extension of first dark costal spot along R and its distal margin convex beneath first radial cell, second costal pale spot large, enveloping distal half of second radial cell and not extending to M_1 , third costal pale spot small, separated from wing margin and far before distal tip of cell R_5 , its proximal margin distinctly convex and distal margin shallowly concave, consequently third costal dark spot constricted between two pale spots, cell M_1 with a large oval pale spot on basal half and a small oval pale spot far before distal margin, cell M_2 with a small semicircular pale spot along distal margin and without a pale spot under basal oval spot of cell M_1 , cell M_4 with a large semicircular pale spot between M_{3+4} and wing margin, anal cell with large confluent pale spots which arise from wing base, obliquely extend straight and end before tip of Cu_1 , two pale lines present along sides of distal half of M_1 ; dark spots almost subconfluent. Macrotrichia of membrane sparsely distributed along wing margin between tips of R_{4+5} and M_{3+4} , macrotrichia arranged in a line along either side of distal half of M_1 , above distal one-third of M_2 and above distal half of M_{3+4} respectively, cell M_4 and anal cell without macrotrichia. Venation: R_1 ending slightly beyond level of fMCu, R_{4+5} ending at level of distal one-third of wing margin of cell M_4 , first radial cell subequal in length to second cell and very narrow, second radial cell subtriangular, r-m subequal to M_{1+2} and shorter than first radial cell (5 : 9). Halteres white.

Abdomen uniformly brown, sternites subdivided into paired sclerites; cerci yellow; spermathecae: two short-oval, brown, slightly unequal and each with a short chitinized duct, one minute, finger-like and pale brown; brown chitinized part of common duct a little longer than twice of diameter.

Male.—Unknown.

Holotype.—Female; Kodaira-Machi, Kita-Tama-Gun, Tokyo-To, Japan; Oct. 22, 1954 (Kitaoka, by light trap).

This species is very closely allied to *C.*

sigaisis TOKUNAGA, but in the present species TR of fore leg is 2.7, that of middle is 3.4 and that of hind is 2.18, AR is about 1.2, three distal pale spots of wing are far smaller, basal pale spot of cell M_1 is larger than distal and two distal pale spots of cells R_5 and M_1 are distinctly separated from wing margin, while in the allied species TR is 2.3 in fore, 2.86 in middle and 1.85 in hind leg, AR is 0.97-1.04,

three distal pale spots of wing are very large, basal pale spot of cell M_1 is smaller than distal and two distal pale spots of cells R_5 and M_1 are semicircular and not separated from wing margin but broadly touch to wing margin. The new species is named in honour of Dr. S. Kitaoka who has collected this interesting biting midge.

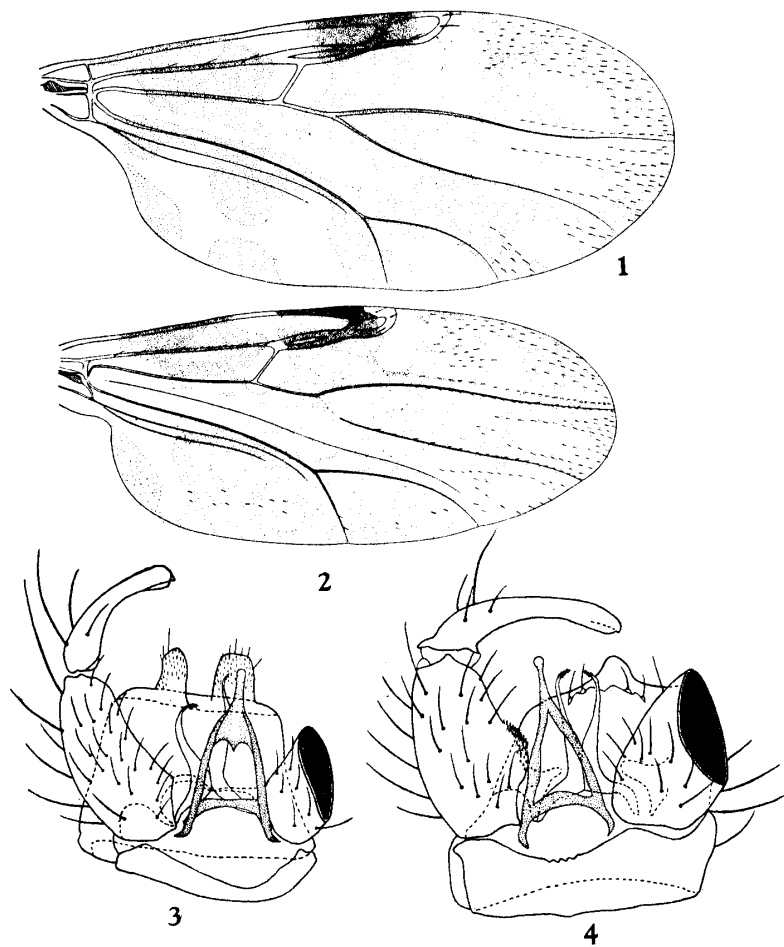


Fig. 1. Female wing of *Culicoides kitaokai* n. sp.

Fig. 2. Female wing of *C. nipponense* n. sp.

Fig. 3. Male hypopygium of *C. sigaisis* Tok.

Fig. 4. Male hypopygium of *C. nipponense* n. sp.