Classification and species list:

The present study was undertaken chiefly to determine the species of Culicoides present in several areas of Thailand and their relative abundance. No large scale taxonomic work was done. Several new species were found, and these will be described fully at a later date. The classification of the genus Culicoides and related genera in the Ceratopogonidae is still in a state of rapid change, and the total world fauna is very incompletely known, especially in the tropical regions. It is anticipated that the subgeneric classification in Culicoides will undergo additional changes before it is stabilized.

In the discussion of the Thailand species which follows the known species are listed in alphabetical order, without respect to subgeneric position. The new species follow the named species in numerical order.

The systematic position of the genus Culicoides and its subgenera is as follows:

Phylum - Arthropoda

Class - Insecta

Order - Diptera

Suborder - Orthorhapha

Series - Neucterocera

Family - Ceratopogonidae

Subfamily - Ceratopogoninae

Tribe - Culicoidini

Genus - Culicoides
Subgenus - Haemaphoractus
Heijersheela
Gulicoides
Trithocoides
Hoffmanic
Avaritic
Gerrata
Beltramyia
Monoculicoides
Selfin
Macfiella

Not all of these subgenera have been reported from Thailand, and in fact some of them are known thus far only from the Western Hemisphere. Members of the following subgenera have been found in Thailand during this study - Haemaphoractus, Heijersheela, Gulicoides and Trithocoides.

Description and discussion of species:

In the following description and discussion of species enough details have been included under the various species to permit identification of the adult males and females wherever possible. In some cases either the male or female was not available for study, and this fact is noted under the species in question. Extended synonymies have not been included, since this is not primarily a taxonomic study, and since much of the world literature was not available for examination.
1. Culicoides (Culicoides) actoni Smith, 1929

(Cing Photograph 1)

Culicoides actoni Smith, 1929 Inv, Jour. Med. Res. 225


Palpi brown, segment 3 moderately broad, (twice as long as greatest width) with broad sensory pit on distal portion, segments in proportion 13-63-46-23-16. Mandible with 10-16 small even teeth (n = 3) Thorax *scutum, *scutellum and postscutellum dark brown; pleuron dark brown.

Mandible with indistinct sub-basal pale band, claw single, tibial comb with 5 spines. Wing - General pattern intermediate between Trihegiosalis species and C. orientalis; dark area over half of first and second radial cells, this area bounded on each side by a light area roughly circular in outline; dark area over transverse center of cell Rs, proximal half of R4 and R5, along R3-X4 Cal, in anal cell and from near base of costa to vein R. Wing tip broadly pale. Costa .58 of wing length Halter knob pale, Abdomen dark brown, Two spermathecae, pyriform, with short sclerotized neck, opening to duct small, spermathecae .039 by .036 mm.

Male - Not available

Distribution Outside Thailand - India

Thailand Distribution - Bang Phra, Khao Yai, Petchburi.

Discussion - Smith (1929) reported that this species fed on man in India.

* discussed in Torre - Bueno (1937)
and it was taken while biting man in the present study, at Khao Yai. No males were available for examination or description. At Bang Phra this species was most abundant during July.

Characteristic of female mandibles, spermatheca and palpi the same as C. schuligi.

* Culicoides (Trithecoides) albilasis Wirth & Hubert 1959

(Culicoides albilasis Wirth & Hubert 1959 Pacific Insects 1: 31)

Female: length of wing .879 mm. (n = 4). Head: dark brown; eye contiguous; antenna with lengths of flagellar segments in proportion of 36-33-34-35-37-36-37-51-49-59-63-91--; antenna ratio, 91 (n = 2), distal sensory tufts present on segments XI-XV; Palpi pale brown, segment 3 moderately, sensory pit on distal surface. Palpal segments with lengths in proportion of 10-33-37-17-19, third segment 1.417 times (n = 4) as long as greatest breadth. Mandible teeth 10 (10-11, n = 4), small triangular teeth of subequal lengths. Thorax: scutum yellow, scutellum and postscutellum dark brown; pleuron yellow above, pale brown on lower half. Legs brown, all knees pale with broad pale bands on each side; hind tibia also pale at apex; claws simple. Hind tibial comb with 4 spines. *Wings: with 2 pale brown areas on costal margin, one between tip of first and half of second radial cell, other larger area just past end of second radial cell in series brown into tip of wing; dark area along apical half of veins; pale areas over r-a crossvein and second radial cell about subequal size; former spot discussed in Torre-Baeza (1957).
nearly covering first radial cell and latter covering centered on
tip of cell; pale area on proximal half of wing and one pale spot in
cubital cell; apex of wing not pale. Costa extending to .70 (n = 4)
of distance of wing tip. Halter knob infuscated. Abdomen: yellow,
3 spermathecae, unequal, all of them broader than long, oval, with
large unsclerotized entrances to ducts. Large one measuring .026 by
.029 mm., and two small ones measuring .016 by .019 mm.

Male: Not available

Distribution outside Thailand: Malaysia, Philippines.

Thailand Distribution: Bang Phra

Discussion: This species was found in February at Bang Phra, in small
numbers. Male was not available for description.

Culicooides (Culicooides) amaniensis Tokunaga, 1937

(Figure 2, Wing photograph 3)

Culicooides amaniensis Tokunaga, 1937, Tentgreso 1 (3):325

Culicooides kagiensis Tokunage 1961, Wirth H.J. & Hubert, Pacific

Insects 3 (1):11

Female: length of wing 1.087 mm. (n = 16) Head: dark brown, eye
contiguous dorsally; antenna dark brown with lengths of flagellar
anternal ratio .987 (n = 6); distal sensory tufts present on segments
III, XI-XV. Palpi dark brown, Segment 3 swollen centrally, distinct
sensory pore. Palpal segments with length in proportion of 19-48-72-
31-28, third segment 2.769 X (n = 11) as long as greatest breadth.
Mandible with 17 (13-21, m = 14) teeth, small, even, triangular teeth.
**Thorax:** Scutum entirely dark brown with dotted, scutellum and postscutellum dark brown; pleuron dark brown. Legs dark, hind femur dark to apex, tibia with distinct sub-basal and subapical white band; first pairs with sub-basal pale band on tibia and second pairs with knee pale. **Wing:** with macrotrichia spread over only distal and marginal area, dark area on first and second radial cells slightly darker than rest of wing, white spot at base of wing, over crossvein reaching costa, over half of second radial cell, but third white costal spot separated from costal margin (differ from *C. peregrinna* Kieffer white spot middle of cell **M**₁, near tip of cell **M**₁, beneath center of cell **M**₂, tip of cell **M**₂, nearly almost cell **M**, above cubital fork, base, middle and tip of anal cell, tip of cell Cu. Costa extending to \(0.67\) \((n = 16)\) of distance of wing tip. Halter knob pale. **Abdomen:** dark brown, 2 spermathecae, pyriform with short sclerotized neck, opening to duct small, measuring \(0.056\) by \(0.046\) \((n = 8)\) \(1.26\) as long as greatest breadth.

**Note:** Not available.

**Distribution outside Thailand:** Ryukyu Island, Japan, Manchuria, Taiwan to India, Indonesia, New Guinea.

**Thailand Distribution:** Bang Phra, Nakhon Nayok, Kanchanaburi, Khao Yai (Nakorn Nayok), Petchburi, Chiangmai.

**Discussion:** This species has been reported to feed on man and also was collected while biting man to Khao Yai. It was the most abundant species at Bang Phra during June and predominated in the limited catches from Khao Yai and Kanchanaburi.
Culicoides (Tritycoidea) anophelis Edwards, 1922

(Figure 4, 'Wing Photograph 4')


**Female**: Length of wing 1.035 mm. (n = 6). **Head**: dark brown, eye contiguous dorsally, antennae dark with lengths of flagellar segments in proportion of 34-34-36-36-37-34-34-36-44-44-59-61-97; antennae ratio 912 (n = 2); distal sensory tufts present on segments III, XI-XV. Palpi dark brown, segment 3 very stout, with sensoria scattered on surface of apical half of segment. Palpal segments with lengths in proportion of 22-23-42-20-25, third segment 1.68 x (n = 6) as long as greatest breadth. Mandible with 15 (13-17, n = 14) teeth, curved teeth, proximal ones largest. **Thorax**: Scutum, scutellum and postscutellum dark brown; pleurae pale brown. Legs pale brown, fore and mid legs with knee pale and broad apical band on femora and basal band on tibia pale; hind legs with knee dark, tibia with base broadly pale. Femur claviform on female. **Wing**: generally with dark streak along veins and moderately pale areas in cells; 2 large very pale yellow spots, one centering on r+1 crossvein and other apex of second radial cell, apex of wing narrowly pale. Costa extending to .69 (n=6) of distance of wing tip. Halter knob infuscated. **Abdomen**: Dark brown, terga poorly sclerotized. 3 spermathecae, sub. equal, measuring .038 by .032 mm., pyriform with short sclerotized neck, entrances to duct small.

**Male**: Not available.

**Distribution Outside Thailand**: Malaya, India, Sumatra, Burma, Ceylon, Hong Kong, Indochina, Taiwan, Tonkin, as far as New Britain.

*discussed in Torre - Beвро 1939*
Thailand distribution: Bang Phra, Bangkok, Chiangmai.

Discussion: This species is remarkable for its habit of obtaining a second-hand meal of blood by engrafting through the stomach wall of anopheline mosquitoes which are in the act of feeding, or have recently fed on a worm-blooded host. *S. anophelis* was collected in this study while attached to *Anopheles stephensi* and *A. leporiennis candidiensis*. It was previously reported attached to *A. annulipes*, *A. dirus*, *A. herbertrocki*, *A. subpictus*, *A. vagus*, *A. eucinus*, *A. maculatus* and may attack *Culex pipiens fatigans* and *Manoecioid Henneguizoides annulifera* (Theo.). It was a maximum number at Bang Phra in February and had one of the most common species among Trithemecoides Group of Thailand.

*Culicoides (Mitomyrphida) arakawa* (Arakawa), 1943

(Figure 5, Wing Photograph 5)

*Culicoides arakawa* (Asakawa), 1937. Tenhirida 1 (3): 296


Thorax: scutum brown, scutellum and postscutellum dark brown, pleuron light brown. Legs dark brown, knee spot dark, pale band at apex of femur and subapical of tibia. Hind tibial comb with 5 spines. Wing with distinct circular spots, microtrichia spread over almost entire surface of wing, small dark area on first and second radial cell, first white costal spot narrow extending from costa over r-m crossvein, 2 round pale spots in cell R₅, one at extreme wing tip and two just beyond second radial cell, the posterior one separate from vein M₁ on distal corner of cell R₅. Cell M₄, M₅ each with two distinct circular spots; anal cell with a double circular spot on distal part and one on proximal part; suffused spots below vein M₄-M₂, behind arculus and in anal cell. Cubital cell with a distinct circular spot along wing margin. Seven peripheral spots all touching on or at margin of wing; five isolated white spots nearly arranged in a transverse line which extends from costal margin distal of second radial cell to anal margin between ends of cubital cell. Costa extending to .60 (n = 16) of distance of wing tip. Falter knob dark. Abdomen: dark brown, 1 spermatheca, sclerotized, large elongate, measuring .138 by .0678 mm. (n = 10), entrance to duct small.

Male—Head with eye contiguous, wing long and narrow, less fusiform than in female, second double costal spot smaller, other white spots larger than in female. Male genitalia with apicolateral process not very broadly separated, rather short and blunt; aedeagus with blunt, flaring enlarged tip, heavily chitinized throughout; parameres fused, with laterally directed basal arm, slender stem and rather stout, simple, laterally bent tip.
Distribution outside Thailand: - Japan to Manchuria, China, Taiwan, Siberia, Indonesia, New Guinea, Latin.

Thailand Distribution: - Bang Phra, Udon Thani, Rajburi, Petchburi, Bangkok, Chiangmai.

Discussion: This species commonly feeds on domestic fowl and may transmit a varioliform disease of their (Tokunaga 1937). Species predominated in the catches from Udon and Rajburi. The maximum number occurred at Bang Phra in February.

Culicoideas (Culicoideas) distinctus Sen. & Das Gupta, 1959
(Figure 5, Wing Photograph 6,7)


FEMALE: Length of wing 1.6777 mm.


Thorax: Scutum, scutellum and postscutellum dark brown; pleuron dark brown. Legs dark brown, femur with indistinct sub-basal pale band, tibia with sub-basal and subapical pale band. Wing: with distinct circular spot, macrotrichia spread over most apical half of wing; distinct circular white spot on crossvein, at extreme apex of cell R3,
cell 61, 62, in cubital cell, above cubital fork, middle of cell 8-2 transverse white band in axil cell and just beyond second radial cell. Costa extending to 1/9 of distance of wing tip. Halter knob dark.

Abdomen: brown, 2 spermathecae, large one measuring .056 by .043 mm., small one measuring .043 by .039 mm. pyriform with long sclerotized neck, opening to duct small.

Male: head with eye separated; wing small, no macrotrichia, male hypopygium with ninth tergite very narrow, apicolateral process long and pointed tip; caudalmedian margin between them transverse; odonagus Y-shaped, slender with flaring at tip; paramere slender with bent tip.

Distribution outside Thailand: India

Thailand distribution: Bang Phra.

Discussion: This species was known previously only from India. This is a new record for Thailand and was found at Bang Phra in July.

Culicoides (Trithecoides) floesserana Macfie, 1937
(Figure 6, Wing photograph 8)

51 (6): 469 - 472.

Mandible with 20 teeth, apical tooth distinctly larger, teeth in middle of series small and even, triangular, 5-6 proximal teeth in series very sharp and directed distad. Thorax: Scutum entirely pale yellow; scutellum pale brown, postscutellar dark brown; pleuron yellow above, dark brown lower. Legs pale brown, fore and mid legs with knees, distal 2 of femur and basal 2 of tibiae pale yellow; hind femur brown with broad subapical pale band; knee dark; hind tibia entirely pale. Hind tibiae cuneate with 4 spines. Wing: with merostriae scattered at the margin; 2 dark areas, one between first and second radial cell and another behind the second radial cell in cell R₂, dark area along vein, pale area over r-m crossvein and second radial cell very large, latter spot covering second radial cell nearly to base and scarcely extending past apex of cell into cell R₂; apex of wing not pale. Costa extending to 7/8 distance of wing tip. Halter knob pale. Abdomen: yellow, 3 anepisternae, subequal, pyriform, entrances to ducts small and sclerotized, a short distance, each measuring .026 by .029 mm. (1.24 as long as greatest breadth)

Male: Not available.

Distribution Outside Thailand: Malay, North Borneo, Philippines, Sarawak

Thailand distribution: Bang Pia, Bangkok, Chiangmai.

Discussion This species reported to feed on men and cattle. It was first confused with C. anomolosis Edwards and was the basis for some erroneous records of C. anomolosis biting vertebrates. Macfie recognized it as different in 1957, but called it a variety of C. anomolosis. However, C. flavescens is quite different and is readily recognized
by its distinctive mandibular teeth and entirely yellow scutum.

Only one specimen was found at Ding Past in February.

**Culicoides (Trithecoides) flaviscutatus** Wirth & Hubert, 1959

(Figure 7, Wing Photograph 9)

*Culicoides flaviscutatus* Wirth & Hubert, 1959. Pacific Insects 1 : 34

**Female** : Length of wing .662 mm. (n = 3) Head : Dark brown, antenna brown with lengths of flagellar segments in proportion of 29-36-43-36-33-33-43-46-56-56-75-3; distal sensory tufts present on segments XI-XIV. Palpal brown, segment 2 wider, with scattered sensilla on distal area. Palpal segments with lengths in proportion of 10-33-36-16-20; third segment 2X(n = 3) as long as greatest breadth. Mandible with 12 teeth, (12-13, n = 3), even, triangular teeth. Thorax : Scutum entirely yellow, scutellar and postscutellum dark brown; pleuron pale brown. Legs dark brown, fore legs with knee spot blackish, femur with subapical and tibia with sub-basal brown; pale bands; mid leg with knee pale, apex of femur and base of tibia broadly pale; hind leg with femur all dark, tibia usually with narrow basal and apical pale bands. Claw simple. Hind tibial cone with 5 spines. Wing: anterior margin dark brown with 2 pale spots, one centering over 1-2 crossvein and other over end of second radial cell; less distinct pale spots also present on tip of wing; base of cell M₁, in anal cell and in cubital cell, in cell M. Costa extending to .67 of distance of wing tip. Halter knob infuscated. Abdomen : dark brown, 3 spermathocoeae, large one measuring .036 by .023 mm. and two small ones .021 by .018 mm., unequal with broad, unsclerotized entrances to ducts large and oval.
Male: Not available.

Distribution outside Thailand: North Borneo, Ceylon, India, Malaysia, Philippines, Sarawak, Sumatra.

Thailand distribution: Bang Phra, Dan Ta Nuang, Dansai, Loei, Paiao, Chiangrai, Bangkok, Palau Panjang, Phangnga, Chiangmai.

Discussion: This species is reported to feed on man and deer (Wirth & Hubert 1959) it was confused with C. anophelis Edwards and C. rarpalpis Smith in the early literature, but the combination of even mandibular teeth, entirely pale scutum, pale halter and entirely dark hind femur serve to distinguish them from other similar species. Very small number were found in February at Bang Phra.

Culicoides (Culicoides) seminus Macfie, 1937

(Wing Photograph 10)


Wing: with macrotrichial spread over most entire surface of wing, pattern very closely C. arakawai but all pale spots larger. Dark band over second radial cell, base of wing and anal cell pale; with small dark spot on vein Cu₁ and medial cell. First white spot which envelops the cross-vein is rather larger and covers almost the whole of the first radial cell, two pale circular spots just beyond second radial cell, the posterior one at extreme wing tip in cell R₅; cell M₂, and M₁ each with 2 circular pale spots; another spot in cubital cell. Costa extending to .60 (n = 15) of distance of wing tip. Halter knob infuscated. Abdomen: dark brown, 2 spermatothecae, ovate with short sclerotized neck; opening to duct small; measuring .042 by .075 mm. (n = 5, 1.27 as long as greatest breadth).

Male: Head with eye separated, with long and narrow, less fumose than in female, second radial cell smaller. Male genitalia with apicolateral processes not very broadly separated rather blunt and long, shallow posterior median cleft;edeagus with blunt, flaring tip, slender shape; paramere with laterally directed basal arm, slender stem with bent tip.

Distribution outside Thailand: Malay

Thailand distribution: Bang Phra.

Discussion: This species has a wing pattern resembling very closely C. arakawai, but it has two spermatothecae while C. arakawai has only one. It reached a maximum number from November to February in Bang Phra. Characteristic of female mandibles, spermatothecae, and palpi the same as C. schultzei.
Culicoides (Neijereoides) guttifer de Neijere, 1922

(Figure 3, Wing Photograph 11)


Palpi dark brown, segment 5 long and swollen centrally, distally with a very broad, shallow, sensory pit. Palp segments with lengths in proportion of 23:59:64:24:24, third segment 2.064 X (n = 8) as long as greatest breadth. Mandible with 12(11-14; n = 7) teeth, small, even, triangular teeth. Thorax: scutum brown, scutellum brown; postscutellum dark brown. Pleuron as brown as scutum.

Legs mainly dark, first pair with subapical white band on femur and sub-basal white band on tibia, second pair similarly marked but the femoral band is less distinct; hind legs all dark except for sub-basal light band on the tibia. Hind tibial spur with 4 spines, one longest.

Wing: wing with macrotrichia dense over most of wing, dark area over first and second radial cell; first white costal spot extending from costa over r-m crossvein and become narrower at crossvein, second double spots just beyond second radial cell, third costal spot on distal corner of cell R5, another spot just beneath first radial cell; cell M1 and cell M2, each with two distinct circular spots, anal cell with small double circular spots; cubital cell with a distinct circular spot along wing margin.
suffused spots below vein 512, between Cu vein into anal cell, just behind arculus. Costa extending to .62 (n = 3) of distance of wing tip. Halter knob dark. Antennae: brown, 1 spermatheca, sclerotized, ovate with a very long duct, measuring .11 by .056 mm. (n = 3, 1.76 as long as greatest breadth), opening to duct small.

Male: Head with eyes separated, wing long and narrow; macrotrichia fewer; second double costal spot and white spot beneath first radial cell smaller but others larger than in female. Male genitalia, hypopygium with ninth tergite narrow, straight sides, and deep posterior median cleft, well developed apicolateral process, a very broadly separated; aedeagus lightly chitinized with fairly stout basal arms, distal stem stout and flaring at tip; parameres with large basal knob directed laterad, rather stout and simple, the bent tip without distal fringing spines.

Distribution outside Thailand: Saveramp, Padana, Sukon.

Thailand distribution: Bang Phra, Patthar, Saiburi, Chiangmu.

Discussion: Wing pattern very close to. Chakravarti except for one more white spot just beneath first radial cell, which is present only in cutifor. It had a total of 8254 number in January in Bang Phra.

**Culicoides (Culicoides) hoffi** Causey, 1938

*(Wing Photograph 12)*

**Culicoides hoffi** Causey, 1938. Amer. J. Hyg. 27: 406

**Female:** Length of wing .846 mm. Head: dark brown, eye contiguous, antenna pale brown with lengths of flagellar segments in proportion of 23-29-29-29-29-29-46-46-46-56-79; antenna ratio .6813,
distal sensory tufts present on segments III, V, VII-X. Palpi dark brown, segment 3 moderately swollen with a very broad, shallow sensory pit on distal end. Palpal segments with lengths in proportion of 9:35:46:13:19, third segment 2 X as long as greatest breadth. Mandible with 10 teeth, small, even, triangular teeth. Thorax: Scutum, scutellum pale brown, postscutellum dark brown. Pleurae light brown. Legs light brown, first and second pairs with subapical pale band on femur and sub-basal pale band on tibiae. Hind legs with femurs dark, indistinct pale band on sub-basal part, tibia with both subbasal and subapical pale bands. Wing: pattern very close to C. genialis, macrotrichia fewer; dark band over second radial cell. White spots at base of wing, base of cell R5, tip of cell M5, tip of second radial cell, just above mid portion of vein M1, near tip of cell M1, center of M1, tip of M2, posterior to base of vein M2, above subital fork and two in anal cell. Costa extending to .56 of distance of wing tip. Abdomen: light brown, 2 spermatotheca, pyriform.

Male: Not available.

Thailand distribution: Bang Phra, Bangkok, Chiangmai, Ranchoaburi, Rajburi.

Discussion: This species resembles C. similis but differs in having a distinct white spot just above mid portion of vein M1 and having fewer macrotrichia on wing. A single specimen was found at Bang Phra in December.

Characteristics of female mandibles, spermatotheca and palpi the same as C. schultzei.
Culicoides (Tribecolides) humeralis Okada, 1941

(Figures 11, Wing Photograph 13)

Culicoides humeralis Okada, 1941. Tokyo Imp. Univ., Jour Ent. gr. 15 : 20


Female: Length of wing .834 mm. (n = 2). Head: dark brown, eye contiguous dorsally, antenna brown with lengths of flagellar segments in proportion of 33-39-36-43-46-45-43-49-63-66-69-93.; antennal ratio .937; distal sensory tufts present on segments III, XI-XV. Palpi brown, segment 3 moderately swollen, sensory distally. Palpal segments with lengths in proportion of 19-46-39-16-16, third segment 2.052 as long as greatest breadth. Mandible with 6 (6-7', n = 3), curved teeth, distal one largest. Thorax: Scutum bright yellow with dark brown area on anterior margin, scutellum and postscutellum dark brown; pleuron yellow above, dark brown below. Legs dark brown, base of femur narrowly pale; fore legs with knee dark and broad pale subcubital femoral and sub-basal tibial bands; mid leg with distal \( \frac{1}{2} \) of femur and \( \frac{1}{3} \) of tibia yellow, hind femur dark to tip, hind tibia yellow with broad dark band in the middle part. Claws simple. Wing: 3 very dark costal area, second radial cell pale on distal half, wing tip broadly pale. Costa extending to .80 of distance of wing tip. Halter knob pale. Abdomen: Light brown, 3 spermatozoa, unequal, with large entrance to ducts; large one measuring .033 by .036 mm., broader than long; 2 small ones each measuring .023 by .026 mm. also broader than long.
Male: Not available.

**Distribution outside Thailand:** Japan, Malaya, Taiwan, Eastern Siberia.

**Thai distribution:** Ping Phra Ban Po Muang, Donsai, Loci, Palau Panjang, Phangnga, Chiangmai, Kao Yai.

**Discussion:** This species was reported to bite men in India and was collected during the study while biting men at Kao Yai. Small number was found in December at Bang Prome.

*Culicoides (Culicoides) agdogelli yuelf., 1961*

(Figure 12, Ting Photograph 74)

**Formula:** Length of wing .929 mm. (n = 13)


**Wing:** macrotrichic spread over alloscutal entire surface of wing, dark area over second radial cell and half of first radial cell; dark band along veins, middle of cell R5, R4, M2, and anal cell. Other dark band extend from anterior of costa cell to cell R, protrude in cell M. Costa extending to .62 (n = 13) of distance of wing tip. Halter knob pale.
Abdomen: dark brown, 2 spermathecae, oval with short sclerotized neck, measuring .077 by .051 mm., subequal size, entrance to duct small.

**Male:** Not available.

**Thailand distribution:** Bang Phra, Chiangmai.

**Discussion** This species was first reported in Philippine Islands.

This is the first record of this species of Culicoides for Thailand.

It reached a maximum number in February at Bang Phra.

**Culicoides (Culicoides) orientalis Macfie,**

(Wing Photograph 15)

**Culicoides orientalis Macfie,**

**Female:** Length of wing .909 in. (n = 7). Head: dark brown, eye contiguous above, antenna dark brown with length of flagellar segments in proportion of 23-24-25-25-25-25-27-38-38-42-45-71; antenna ratio .365 (n = 3), distal sensory tufts present on segments III, XI-XV. Palpi dark brown, with lengths of palpal segments in proportion of 41-41-43-26-25, third segment 2.388 X (n = 5) as long as greatest breadth. Mandible with 13 (10-16, n = 9) teeth, small, even, triangular teeth. Thorax: Scutum, scutellum and postscutellum entirely dark brown. Pleuron dark brown. All legs dark brown. Wing: grayish, dark spots over first and second radial cells, and middle of cell R5. Confuent light spots at base of wing, on crossvein, over most of second radial cell, large white bend at extreme apex of cell R5 (tip of cell), throughout cell M, M1, M2 and anal cell and in cell Cu.

Costa extending to .56 (n = 7) of distance of wing tip. Walter knob pale.
Abdomen: dark brown, 2 spermathecae pyriform, highly chitinized, with short sclerotized neck, opening to duct small; measuring 0.046 by 0.037 (n = 2, 1.243 as long as greatest breadth).

Males: Not available.

Thailand distribution: Bang Phra, Bangkok, Trang, Nakhonratchasrima, Petchaburi, Chiangmai.

Discussion: This species has a wing pattern resembling C. notori but differ in having area of cells M1 & M2 nearly pale white. No males were available for examination or description. At Bang Phra this species reached maximum numbers in January and February.

Characteristic of female mandibles, spermathecae and palpi the same as C. schultzei.

Culicoides (Triatomaoides) pilipfer Das Gupta & Gosh, 1956
(Figure 15, Jing Photograph 16)

Culicoides pilipfer Das Gupta & Gosh, 1956. Colloquia Soc. Trav. Med; Bull. 4 : 122

Females: Length of wing 1.703 mm. (n = 9). Head: dark brown, eyes contiguous dorsally; posterior dark with lengths of flagellar segments in proportion of 28:28:30:34:36:36:36:36:51:49:56:56:56:82; antennal ratio 0.915 (n = 4); distal sensory tufts present on segments III, XI-XV. Palpi dark brown, segment 3 slender, distally with shallow sensory pit. Palpal segments with lengths in proportion of 14:37:57-21-19, third segment 2.59 X (n = 2) as long as greatest breadth. Mandible with 7 (6-8, n = 9), curved teeth, distal ones larger.
Thorax: Scutum yellow, scutellum and postscutellum dark brown; pleuron brown. Legs dark brown, fore-legs with knee spot dark, broad subapical band on femur and sub-basal band on tibia; mid legs with pale knees, broad band at apex of femur and basal of tibia, hind femur dark to apex, tibia with broad dark band in middle, tarsis pale, Claws simple.

Wings: Marked dark area on costal margin, disc quite dark along veins and indistinctly pale areas in cells; 2 very pale spots on costal margin, one centered over r-m crossvein, other or apex of second radial cell, latter variable in size; apex of wing broadly pale.

Costa extending to .81 (r = 9) of distance of wing tip. Halter knob infuscated. Abdomen: Dark brown, 3 spermathecae, unequal, with large entrance to ductus; large one measuring .027 by .027 mm., 2 smaller ones each measuring .023 by .023 mm.

Hab : Not available.

Distribution: Outside Thailand: India, Malaya, North Borneo, Philippines, Sarawak, Sumatra, Taiwan.


Discussion: This species was one of the most common species among Trithecoides Group of Thailand and has a maximum number during February at Bang Phra.

_Culicoides_ (Trithecoides) baraflavescens Wirth & Hubert, 1959
(Figure 16, Wing Photograph 17)

Female: length of wing 1.051 mm. (n = 9) Head: dark brown, eyes separated; antennae pale brown with lengths of flagellar segments in proportion of 39-46-42-44-44-42-45-62-61-76-51-121; antennal ratio 0.55 (n = 6), distal sensory tufts present on segments III, XI-XV.
Palps pale brown, segment slender with sensoria scattered on surface of apical half. Palpal segments with lengths in proportion of 20-43-48-30-24, third segment 2.28 X (n = 4) as long greatest breadth.
Mandible teeth 24, apical teeth distinctly larger and separated from second, distal teeth of series large, decreasing in size to smaller, even, triangular teeth, 4-5 proximal teeth in series very sharp and directed distally. Thorax: scutum yellow, with dark brown area on anterior margin; scutellum and postscutellum dark brown; pleuron yellow above, dark brown on lower 2/3. Legs pale brown, fore and mid legs with knees, distal 1/2 of femur and basal 1/2 of tibia pale yellow, hind femur brown with broad subapical pale band, knee dark, hind tibia entirely pale; claws simple. Hind tibial comb with 4 spines. Wing: with 2 dark brown areas on costal margin, one between first and second radial cell, another larger area just past end of second radial cell, cell R5 posterior to the latter distinctly infuscated across to vein M1; dark area along entire veins; pale areas over R5, crossvein and second radial cell moderately large, forewings not covering about 2/3 of first radial cell and latter covering second radial cell nearly to base; pale area in anal, in cubital and median cell. Costa extending to 0.20 (n = 9) of distance of wing tip. Halter knob pale. Abdomen: yellow, 3 spermathecae, subequal, pyriform with short sclerotized neck, entrance to duct small, each measuring 0.36 by 0.26 mm. (1.32 as long as greatest breadth).
Rule: Not available.

Distribution: Outside Ceylon.

Thailand distribution: Bang Phra.

Discussion: Similar to *C. melolitica* and *C. poliipher*, it was one of the most common species among the Trypoxylon group of Thailand Culicidae. It resembles *C. flavescens*, but differs in having dark brown area on the anterior margin of scutum while *flavescens* has scutum entirely yellow. This species has a maximum number in February, with *C. melolitica* and *C. poliipher*, at Bang Phra.

Culicidae (Culicoides) *poliipherensis* Tolnay, 1937

(Wing Photograph 18)


Thorax: Scutum, scutellum and postscutellar dark brown; pleurae brown.

Legs dark brown, first pair with indistinct sub-basal and subapical pale band on tibia; hind femur dark, tibia with broad indistinct subapical and subdistal pale band, claw simple. Hind tibial comb with 4 spines.
wing: with macrotrichia spread over more than half of apical tip of wing; white spots very large; all dark bands nearly arranged in a transverse line, which include: dark band in the middle of cell R and in anal cell; dark band between first and second radial cell, joined with the one at base of radial fork and along vein Cu 1; dark band in the middle of cell \( R_2 \), middle of cell \( b_1 \), middle of cell \( b_3 \) and along vein \( R_3 \), another dark band near base of vein \( Cu_1 \).

Apex of wing broadly pale. Costa extending to \( R_1 \) (n = 9) of distance of wing tip. Halter knob pale. Abdomen: brown, 2 spermathecae, unequal, pyriform with sclerotized neck, entrances to ducts small, measuring .046 by .039 (n = 5, 1.17% as long as greatest breadth).

Male: Not available.

Distribution Outside Thailand: Japan, Micronesia, Palau.

Thailand distribution: Bang Phra, Prachubkirikarn.

Discussion: This species was first reported from Japan, and the present record is the first for Thailand. The species bites man, and reached its maximal numbers at Bang Phra in July.

Characteristic of female mandibles, spermathecae and palpi the same as \( C. \) madwelli.

Culicoides (Culicoides) neregrinus Kieffer, 1910

(Figure 17, Wing Photograph 19)

Culicoides neregrinus Kieffer, 1910. Mem. Ind. Mus. 2; no. 4, 186 - 194


Female: Length of wing 1.095 mm. (n = 15). Head: Dark brown, eye
contiguous dorsally, antennae dark brown with length of flagellar segments in proportion of 54-30-31-32-34-34-33-38-44-44-58-68-96; antennal ratio 0.806 (n = 4), distal sensory tufts present on segments III, XI-XV. Palpi dark brown, third segment slightly swollen posterior to sensory pit. Palpal segments with lengths in proportion of 16-54-67-24-29; third segment 2.596 X (n = 11) as long as greatest breadth.

Mandible with 13 (11-15, n = 11) small and equal teeth. Thorax: scutum, scutellum and postscutellum entirely dark brown; pleuren dark brown.

Legs dark, knee pale, hind tibiae with subapical pale band. Wing: dark area on first and second radial cells slightly darker than rest of wing, white spots at base of wing, over cross vein reaching costa, over rest of second radial cell, near tip of cell R2, middle of cell M1, near tip of cell M2, tip of cell M3, beneath center of vein M2, above cubital fork, posterior to base of vein M2, base of cell Cu, tip of cell Cu, base, middle and tip of anal cell. Costa extending to 0.53 (n = 13) of distance of wing tip. Müller knob infuscated.

Abdomen: dark brown, 2 spiny processes, heavily chitinized, pyriform, measuring 0.952 by 0.04 (n = 9) 1.375 as long as greatest breadth.

Male: Coloration as in female, wing with some pale spots broader than wing of female. Male hypopygium with terminal portion of the aedeagus long and tapering. Hinges stout, with basal spine, tip with tuft of hairs near apex.

**Distribution outside Thailand:** Japan, Malaysia, Sumatra, Assam, India to New Guinea, Indonesia, Taiwan.

**Thailand Distribution:** This species occurs in greater abundance and is more widely distributed than any other species of *Culicoidea* of
Siam. Found in Bang Phra, Udornthani, Ayuthuri, Pattaburi, Bangkok, Chiangmai,

**Discussion** This was the most abundant species through most of the year at Bang Phra except during June. The writer noticed that there were no *G. peregrinum* in the light traps from Prachub Khiri Khan and Kanchanaburi; while it was very rare at Udornthani. Dr. N. S. S. Nadaka reported that this species bit human beings at Balugon in Orissa.

*G. scutellaris* (G. strumula) recusum Deffivals, 1961

*(Wing Photograph 26)*

**Female**: Length of wing 1.066 mm. (n = 11). Head: dark brown, eye separated; antennule pale brown with lengths of flagellar segments in proportion of 51-25-29-30-32-32-35-40-48-50-54-63-50; antennal ratio 92% (n = 5), distal sensory tufts present on segments III, V, IX, XI-XV. Palpi dark brown, segment 7 long and moderately swollen, distally with a very broad, sensory pit. Palpal segments with length in proportion of 18-45-52-24-22, third segment 8.416 X (n = 10) as long as greatest breadth. Mandible teeth 13(10-15, n = 9), small, even, triangular teeth. Thorax: Scutum, scutellar and postscutellar dark brown; pleuron brown. Legs mainly dark; first and second pairs with sub-basal pale band on tibia and hind tibia with both sub-basal and subapical pale bands. Hind tibial crest with 5 spines; one longest. Wing: with dark area on first and second radial cell and middle of cell 35 slightly darker than rest of wing; wing base white with an obscure dark spot on Cul in this white area; first white spot covering
r-m crossvein, elongated, constricted at middle at radial vein; second spot covering distal half of second radial cell, convex on outer margin; third spot rarely separated from costal margin; white stripes along vein M₂. Cells K₁, and K₂, each with 2 white spots, the first two at tip of cell separated but others very closely just separated by vein M₂; another white spot in front of median fork, above cubital fork, circular spot in cubital cell and two in anal cell. Costa extending to .62 (n = 11) of distance of wing tip. Halter knob pale. Abdomen: dark brown, 2 spermathecae, pyriform with short sclerotized neck, and with a rudimentary; each measuring .045 by .035 (n = 4, ratio 1.31 as long as greatest breadth), opening to duct small.

Male: Not available.

Distribution outside Thailand: Philippines.

Thailand distribution: Bang Pada, Bangkok.

Discussion: This species also is a new record for Thailand Culicoides. It was first described from the Philippines. It resembles C. peregrinus but differs in having only one white spot in the cubital cell while C. peregrinus has two. It was at maximum number in December at Bang Pada.

Characteristic of female mandibles, spermathecae and palpi the same as C. medowalli.

Culicoides (Culicoides) schultzei Enderlein, 1906

(Figure 13, Wing Photograph 21)


Culicoides oxymops Kieffer, 1910, Ind. Mus., Des. 2:193 (Calcutta)

Female: Length of wing .906 (n = 12) Head: dark brown, eyes narrowly
Scutum, scutellum and postscutellum dark brown; pleuron dark brown.
Legs dark brown, femur with indistinct sub-basal pale bands first and second pairs with also subapical pale band. Tibia with sub-basal, hind tibia with very broad subapical pale band. Wing: with numerous distinct pale spots, including in cell M5, a double, transverse distal one and a small round one between this and poststigmatic pale spot. Wing without pale spots at extreme apex of cell M5, white spots at middle of cell R, middle of cell M2, near tip of cell M1, tip of cell M3, above cubital fork, transverse cell Cu1, tip of cord cell and middle of anal cell. Costal extending to .54 of distance of wing tip. Halter knob infuscated. Abdomen: dark brown, 2 spermathesae plus a rudimentary; measuring .048 by .04 (n = 4, 1.2 to long as greatest breadth.)

Male: wing with some white spots larger than in female; odonagus with broad tip, paramere slender with sinuate stem and tip with very fine fringing hairs, epicolateral processes long and closely approximated.

Distribution outside Thailand: Africa, Asia to Iraq, W. Pakistan, Jassuri Island, Japan, Ceylon, Indonesia, New Guinea, Taiwan.
Thailand distribution: Song Phra, Kamphaeng Phet, Rangsit, Bangkok, Chiang Mai.

Discussion: This species had a maximum number in August, at Song Phra.

Culicoides (Culicoides) shortti Smith & Suwaninath, 1952

(Wing Photograph 22)


Female: Length of wing 3.24 mm. (n = 6) Head: Light brown, eye separated, antennae light brown with lengths of flagellar segments in proportion of 28-24-25-26-28-26-26-36-35-35-35-62; antennal ratio 0.962 (n = 3), distal sensory tufts present on segments III, VIII-X. Palpi very dark brown, third segment swollen centrally. Palpal segments with length in proportion of 11-30-54-17-19, third segment 2.571 X (n = 2) as long as greatest breadth. Mandible with 15 (12-1', n = 9), teeth, small, even, triangular teeth. Thorax: Scutum, scutellum and postscutellum entirely dark brown; pleurae dark brown. Legs pale, femur and tibiae with sub-basal and subcubital pale band except hind femur with only sub-basal pale band, tibiae with very broad subcubital pale band. Hind tibial cunea with 5 spines. Wing: with dark area over second radial cell, white spots at base of wing, over crossvein, tip and below second radial cell, central and tip of cell R5, two spots in cell R1, two in cell R2, two in cell M, and one in cell Cu and three in anal cell. Costa extending to .56 (n = 6) of distance of wing tip. Halter knob dark. Abdomen: pale brown, 2 spermathecae, pyriform with short sclerotized neck, opening to duct small, measuring .037 by .06 (n = 2, 1.15 as long as greatest breadth).
Male: Most available.

**Distribution outside Thailand:** Assam, India.

**Thailand distribution:** Bang Phra, Chiangmai, Bangkok, Rajburi, Karnchanaburi, Petchburi, Chiangmai.

**Discussion:** This man biting species was first described from India. It was found in small numbers at Bang Phra on December and predominated in the catches from Petchburi.

**Characteristics of female mandibles, spermathecae and palpi the same as C. schultzei.**

**Culicoides (Culicoides) similis Macfie, 1932**

*(Figure 19, Wing Photograph 23)*


**Female:** length of wing .949 mm. Head: dark brown, eyes narrowly separated, antenna dark with lengths of flagelle segments in proportion of X-X-19-23-26-23-26-46-43-29-53-53; distal sensory tufts present on segments V, VII-XIII. Palpi dark brown, segment 3 with deep sensory pit. Palpal segments with lengths in proportion of 16-27-49-16-26, third segment 1.807 as long as greatest breadth. **Mandible** with 10 teeth, small, even, triangular teeth. Thorax: Scutum entirely dark brown with dotted, scutellum and postscutellum brown; pleuron light brown. Legs brown, knee black, tibia with sub-basal light bands, first pairs, femur with subapical and tibia with sub-basal pale band. Wing: with macrotrichia spread over most of wing, distinct dark area on first and second radial cells. White spots over crossvein, at tip
of second radial cell, small round one beneath the latter and center of cell M2, extrem apex of cell M3, tip of cell M2, on mid point of vein M2, in cell Cu, above capital fork, 2 in each cell, and 3 in cell Μ. Cost extending to .95 of distance of wing tip. Halter knob infuscated. Abdomen: Light brown, 2 spermathecae, pyriform with short colorized neck, entranced to duct ovip. spermathecae measuring .066 by .036 (1.855 as long as greatest breadth).

Male: Not available.

Distribution Outside Thailand: This species was originally described from the Gold Coast, Africa and later found in India.

Thailand distribution: Bangkok, Chiangmai.

Discussion: This species was first described from India. It was reported to feed on cattle.

_Gulicoides sp.1 (Zonophoracutus)_

(Figure 9 & 10, Jing Photograph 24, 25)


_Thorax:_ scutum, scutellum and postscutellum entirely very dark brown;
pleuron pale brown. Legs dark brown; first pair with sub-basal pale band on femur and tibia; second and hind pairs with sub-basal and subapical pale band, hind femur dark to apex. Wing with dark area over half of radial cell (only one radial cell present), middle of cell R₅. White spot at base of wing, on crossvein, half of radial cell, transverse distal white spot near tip of cell R₅ but not extending to near apex of cell R₅, throughout cell M₁, middle of cell R₂ throughout middle of cell R₂, tip of cell R₄, tip of cell R₅, almost throughout anal cell (two white spots in anal cell), throughout cell Cu₁, Cu₁ extending to 0.74 (n = 15) of distance of wing tip. Halter knob yolk. Abdomen: dark brown, 2 spermathecae, pyriform, highly chitinized measuring 0.051 by 0.041 mm. (n = 11, 1.243 as long as greatest breadth). Male: Head: dark brown, eyes narrowly separated; antennae brown with lengths of flagellar segments in proportion of 103-49-49-49-49-49-49-49-49-139-159-139; distal sensory tufts present on segments II-XIII. Pulpi dark brown, segment 5 moderate, sensory scattered on distal surface. Palpal segments with lengths in proportion of 16-49-75-29-36; third segment 4.562 as long as greatest breadth. Thorax: Scutum, scutellum and postscutellum dark brown; pleuron pale brown Legs mainly dark brown with indistinct sub-basal pale brown tibias. Hind tibial comb with 5 spines. Wing: very long and narrow, with two radial cells which differ from females of some species in this group; distinct veination. Dark band arranged in 4 stripes across wing which include; dark band at wing tip; at apex of second radial cell and middle of cell M₁ and M₂; dark band between first and second radial cell to cell R₅.
at median fork to cubital fork; dark band at middle of costal cell to middle of anal cell. Costal extending to .70 of distance of wing tip. Abdomen: dark brown, male hypopygium with ninth tergite broad, slopes sides and deep posterior radial sib, analagus heavily chitinized, slender with laterally broad eye, stem stout with bent tip.

**Thailand Distribution**: Bang Phra.

**Discussion**: This species is a new record of *Thalium* with a remarkable pattern of wing; all females have only one radial cell while there are two in male. The maximum number occurred in October at Bang Phra.

**Culicoides sp. 2 (Culicoides)**

(Figure 13, Wing Photograph 26)

as, wings Y-shaped, chitinized at base, curved tip; pterostigma with large basal knob pointing lateral, stout with nearly straight, unchitinized pointed tip.

**Female:** Not available.

**Thailand distribution:** Bang Phra.

**Discussion:** Only single male specimen was found at Bang Phra in September.

**Culicoides sp. 3 (Culicoides)**

(Figure 14, Wing Photograph 27)

**Male:** length of wing 1.861 mm. Head: dark brown, eye separated; palpi dark brown, segment 3 slender, distally with shallow sensory pit. Antenna pale brown. Thorax: Scutum, scutellum and postscutum dark brown; pleuron pale brown. Legs: pale brown, all knees dark, tibia with indistinct sub-basal pale band. Wing: pattern like C. maculipennis Belf. But no macrotrichia over surface of wing, dark area over second radial cell and half of first radial cell; dark band along veins, middle of cell M, M, M and medial cell and other dark band extends from anterior of costa cell to cell C, pterostigma in cell M. Costa extending to 0.57 distance of wing tip. Halter knob pale.

**Abdomen:** dark brown; male hypopygium with ninth tergite narrow, curved sides with deep posterior median cleft and well developed apicolateral process; abdomen lightly chitinized at base, Y-shaped very stout with large blunt tip; pteraostigma with large basal knob directed lateral, stout with unchitinized tip.

**Female:** Not available.
Thailand distribution: Bang Phra

Discussion: Only a single male specimen was found at Bang Phra in January.
KEY TO SPECIES OF CULICOIDES

IN THAILAND.

1. One radial cell in female ................ Subgenus Haemosphoractus.
   Culicoides sp. 1
   Two radial cells ......................... 2

2. With one spermatheca ................... Subgenus Meijorsheler (3)
   With two spermathecae ................... Subgenus Culicoides (4)
   With three spermathecae .................. Subgenus Trithecoides (17)

3. Spermathecae short duct, wing with 17 distinct circular spots
   ...................... C. aputwai /2k
   Spermathecae long duct, one more white spot just beneath first radial cell (18 circular spots)... C. muttifer.

4. No white spot at middle of cell M1, M2 ... C. distinctus.
   With white spot at middle of cell M1,
   or both M1 and M2. .......................... 5

5. With white spot on mid of cell M1 only. 6
   With white spot on both M1 & M2 .......... 7

6. One white spot just above middle portion
   of cell M2 ............................... C. huffi.
   No white spot in this position .......... C. similis.

7. Dark area on first and second radial cell projecting
   backward into white spot.................. 8
   No invasion of dark area into white spot ... 9

8. Cell Cu with two white spots............ C. peregrinus.
   Cell Cu with only one white spot......... C. recurvus.
9. White costal spot separated from costal margin... *C. maculipennis*
   With whole white area at costal margin........ 10

10. White spot behind second radial cell emerge beneath the
    second radial cell ............................. 13
    So emerge of white spot under the second
    radial cell .................................... 12

11. Second radial cell much reduced .......... *Culicoides* sp. 2
    Second radial cell simple ..................... 12

12. Area of cell M₁ & M₂ nearly pale white ....... *C. orientalis*
    Area of cell M₁ & M₂ dark with white spot
    at apex ................................. *C. actoni*

13. 3 white spots in cell R₃ .......................... 14
    2 white spots in cell R₅ .......................... 15

14. One white spot at apex of cell R₅ .......... *C. shortti*
    Not as above .................................. *C. schultzei*

15. No nectrotrichia on wing ....................... *Culicoides* sp. 3
    With numerous nectrotrichia spread over the wing.. 16

16. With dark band along the side of vein M₁ & M₂... *C. sciuellii*
    No dark band along the side of vein M₁ & M₂... *C. palpiiquensis*

17. Scutum uniform yellow .......................... 20
    Scutum yellow with dark brown at anterior margin... 10

18. Mandible with 7 teeth only .................... *C. fuscata*
    Mandible with more than 10 teeth ............... 19

19. Mandible with 19 - 23 teeth, apical teeth larger... *C. paraflavosilens*
    Mandible with 12 - 15 teeth, proximal teeth larger
    ............................ *C. anophelis*
20. Mandible with more than 20 teeth........ C. flavuscaena.
    Mandible with 19 teeth or fewer ........ 21

21. Mandible with only 7 curved teeth........ C. maliger.
    Mandible with more than 7 teeth (mostly 10).... 22

    Hind femur with distal joint light........ C. albicrass.

Remarks

1. The two species of the C. gynnontorus group are new species of uncertain status. All female have only one radial cell while there are two radial cells in the male.

2. C. genius will run in this key to C. arakawai. The white spots on the wing are a little larger in C. genius than in C. arakawai.