

Fauna of Arthropods of Medical Importance in Chindo Island, Korea

Han-Il Ree, Won-Ja Lee*, In-Yong Lee and Seung-Hoo Jeon

(Institute of Tropical Medicine, Yonsei University, Seoul 120-752; *Division of Parasitology, National Institute of Health, Seoul 122-020, Korea)

ABSTRACT

Fauna of medically important arthropods in Chindo Island was studied in July 1994. Among eight species of mosquitoes (Diptera: Culicidae), *Culex tritaeniorhynchus* was predominant (46.5% of the total), and *Anopheles sinensis* the next. Seven specimens of the unidentified *Culex* sp. which seemed to be new were also collected. Total 23 species of non-biting midges (Diptera: Chironomidae) were found in Chindo Is. Of them, *Chironomus kiiensis* was the predominant species (67.3%), and *Ch. flaviplumus* the next (15.6%). Three species, *Cladopelma viridula*, *Dicrotendipes septemmaculatus* and *Harnischia urtilamellata* are reported for the first time in Korea, and they are fully re-described with illustrations. Among five species of biting midges (Diptera: Ceraopogenidae) collected, *Culicoides punctatus* was predominant (88.7%). A species of *Foreipomia* was also collected, and this genus is not recorded in Korean fauna. Only two species of domiciliary cockroaches, *Periplaneta japonica* and *P. americana* were collected in small numbers and *Blatella germanica* which is known as the most predominant species in Korea was not found. The predominant species of field rodents was *Apodemus agrarius* and their ectoparasites were *Leptotrombidium orientale* (Acarina: Trombiculidae), *Ixodes nipponensis* (Acarina: Ixodidae), *Laelaps jettmani* and *Eulaelaps stabularis* (Acarina: Laelapidae).

Key words: Fauna, mosquito, non-biting midge, biting midge, cockroach, field rodent, Chindo, Korea

INTRODUCTION

Chindo Island is located at southernmost part of the Korean peninsula and at junction of the Yellow

Sea and the South Sea, and is one of the largest islands in Korea. Since Chindo fauna of the arthropods of medical importance have never been studied, the collection of the target arthropods was carried out on 23-26 July 1994.

Arthropods of medical importance in Korea include mosquitoes which transmit Japanese encephalitis, malaria and filariasis, chigger mites which transmit tsutsugamushi disease, hard ticks which transmit Lyme disease, non-biting midges which cause nuisance and allergic diseases, domestic cockroaches which mechanically transmit causative agents of various infectious diseases, fleas which transmit the plague and murine typhus, and biting midges which are suspected to transmit some viral diseases (Ree, 1993a).

There were quite many breeding sources for mosquitoes, biting and non-biting midges and others, such as reservoirs, streams, irrigation canals, rice paddies and reclaimed land (marsh) from the sea. However, there were long, severe draught, so that most of the water sources were completely or partially dried, particularly all the rice paddies were completely dried up. Quite many rice paddies were re-filled with water which was brought by vehicles or pumped up from underground. However, there was not enough time for aquatic insects to breed. The amount of the precipitation in Chindo area in 1994 was 15.5 mm in May, 72.0 mm in June and 42.6 mm in July, whereas that of 30 years average (1951-1980) in the same area was 102.5 mm in May, 151.0 mm in June and 190.6 mm in July. The amount of rain fall in July 1994 was 4.5 times less than usual, and average temperature of July (27.3°C) was 3.2°C higher than usual (24.1°C). As the result, population densities of water breeding insects were extremely decreased, so that the collection results were poor. Nevertheless, this report will be utilized as fundamental informations for medical entomologists to implement further studies.

MATERIALS AND METHODS

Light trap collection: Light trap collections were carried out for two nights. Nozawa type, black light was used. It was set under the eave of a cowshed at Sokhyon-ri, Kogun-myon on 23 July and at just outside of a pigsty surrounded by rice paddies at Sammak-ri, Uishin-myon on 24 July. All the trapped insects were killed by chloroform in the laboratory and mosquitoes, biting and non-biting midges were sorted. Mosquitoes were pinned and stored in Schmit box and biting and non-biting midges were preserved in 75% ethanol.

Larva collection: Mosquito larvae were collected by dippers and/or aquatic net at all available breeding places such as rice paddies, marshes, streams, and reservoirs. The larvae collected were brought to the laboratory which was temporarily set up at the field, and preserved in 75% ethanol after being killed with hot water and labelled. Around Sanggesa (temple) located at Sachon-ri, Uishin-myon, tree holes were checked. Little amount of water was collected from 2 tree holes. Muds with debris inside tree holes were spooned and put in the plastic bag. In the insectarium of the National Institute of Health in Seoul, the muds were transferred to the plastic container with water. The larvae hatched from the eggs laid in muds were reared to the 4th instar larvae and killed and preserved in 75% ethanol.

Collection of domestic cockroaches: The sticky traps were set up in different buildings: a super

market, fruit shops, restaurant, hotel and a mill house, in which higher cockroach infestation is shown than residential houses. Twenty to thirty traps were set up in each building. After three days the sticky traps were brought back to the laboratory and collected cockroaches were identified.

Collection of field rodents and ectoparasites: Ninety-eight aluminium-made Sherman type traps, baited with oat-pinut butter mixed ball were set up at 4-5 p.m. and removed at next early morning. The mice were killed with chloroform and identified. The dead mice were hung over a beaker in which tap water was put 1 cm deep in order to harvest the chigger mites and other ectoparasites. The ectoparasites which were fallen into the water of the beaker were picked up with a fine brush and put in 75% ethanol for preservation. The ectoparasite harvest was done every morning for two days.

Preparation of the specimens: The mosquito larvae were slide-mounted by Hoyer's solution. The adults of non-biting midges were mounted on slide with phenol-balsam; the antennae, wings and hypopygium were covered by small pieces of cover glasses, separately. The adults of biting midges were mounted on slide with creosote-balsam. Wings, head, antennae and maxillary palps were separated with fine needles and covered by small pieces of cover glasses separately. The chigger mites were mounted with Hoyer's solution and heated with an alcohol lamp for clearing the body and stretching legs. The mosquito adults were pinned for dry specimen.

RESULTS AND DISCUSSION

Mosquitoes (Insecta: Diptera: Culicidae)

The result of mosquito larva collections at various habitats is shown in Table 1. Total 8 species, 3 genera were collected, and *Culex tritaeniorhynchus*, the vector of Japanese encephalitis was the predominant species, being collected 46.5% of the total collections at many different types of habitats. This species was unexpectedly found even at considerably polluted drainage water with *Culex pipiens pallens* together. *Anopheles sinensis*, the vector of both malaria and filariasis, also was collected at wide range of habitats, though the collected number was not many. *Aedes togoi*, the vector of filariasis was found almost all rock pools at seaside with high density. Four larvae of *Culex mimetics* were collected at stagnant water of a stream. This species is originally tropical/subtropical species and is one of very rare mosquitoes, having been recorded only at Seoul (Lee, 1971), Wido Island, Puan-gun, Chollanam-do (Jolivet *et al.*, 1974) and Sintain-ub, Chongub-gun, Chollabug-do (Lee *et al.*, 1984), even though quite many on mosquito distribution were carried out by the previous workers.

It was interesting to note that seven larvae of *Culex* sp. collected at a stagnant stream seemed to be new. The morphological characters are in general similar to *C. pipiens* complex, but differ in several important characters such as siphon index, siphonal hairs, prothoracic hairs, saddle and some others. Because the adult was not found, it was not able to designate as a new species.

The result of the light trap collections was given in Table 2. Total 5,017 females and 103 males of mosquitoes were collected for two nights, and only three species, *An. sinensis*, *C. p. pallens* and *C. tritaeniorhynchus* were identified. Because the light trap was operated at outside of a cowshed and a pigsty, *C. p. pallens* was predominant at both localities. It means that the collection result of light

Table 1. Mosquito larva collections in Chindo Island on 23-25 July 1994

Habitat	Number collected								Total
	<i>Ano. sin.</i>	<i>Culex trit.</i>	<i>Culex p. pal.</i>	<i>Culex sp. A</i>	<i>Aedes togoi</i>	<i>Aedes nipp.</i>	<i>Aedes flav.</i>	<i>Culex mime.</i>	
Stream/stagnant	4	102	0	7	0	0	0	0	113
Stream/stagnant	7	14	0	0	0	0	0	0	21
Marsh	2	28	0	0	0	0	0	0	30
Ditch/stagnant	0	17	0	0	0	0	0	0	17
Ditch/drainage	0	13	47	0	0	0	0	0	60
Ground water	14	46	12	0	4	0	0	0	76
Rock pools	0	0	0	0	200	0	0	0	200
Stream	1	37	0	0	0	0	0	0	38
Ditch/stagnant	1	26	0	0	0	0	0	0	27
Stream/stagnant	11	1	0	0	0	0	0	4	16
Tree holes	0	0	0	0	0	11	1	0	12
Total	40	284	59	7	204	11	1	4	610

Table 2. Mosquito adult collections by a light trap in Chindo Island on 22-23 July 1994

Species	Sokhyon-ri (near cowshed)	Sammak-ri (near pigsty)	Total
<i>Anopheles sinensis</i>	577 (17)*	567 (48)	1,144 (65)
<i>Culex p. pallens</i>	3,048 (19)	764 (17)	3,812 (36)
<i>Culex tritaeniorhynchus</i>	2,026 (2)	35 (0)	2,061 (2)
Total	5,651 (38)	1,366 (65)	7,017(103)

* (): Number of males

traps depends largely upon the place of operation, so it does not represent the actual population density in nature. It is believed that the severe draught strikingly affected mosquito populations, particularly so the rice paddy breeding mosquitoes, *C. tritaeniorhynchus*, for all the rice paddies had been dried up.

Non-biting midges (Insecta: Diptera: Chironomidae)

Total 1,258 adults of Chironomidae were collected by a light trap for two nights, and 21 species, 11 genera were identified, as shown in Table 3, and five species were also collected by sweeping on grasses along a small stream, as shown in Table 4. *Chironomus kiiensis* was the predominant species (67.3% of the total), followed by *Chironomus flaviplumus* (15.6%), and *Polypedilum nubifer* (8.3%). *Ch. kiiensis* and *Ch. flaviplumus* were reported to be most widely distributed throughout the country, the former breeding mainly in rice paddies and the later breeding in highly polluted water, like sewage/drainage water (Ree, 1993b). Total 23 species, 11 genera, 3 subfamilies

Table 3. Light trap collection of chironomidae

Species	Sokhyon-ri	Sammak-ri	Total	%
Chironominae				
<i>Chironomus kiiensis</i>	366	481	847	67.3
<i>Chironomus flaviplumus</i>	140	56	196	15.6
<i>Chironomus circumdatus</i>	1	28	29	2.3
<i>Chironomus plumosus</i>	5	1	6	0.5
<i>Chironomus nipponensis</i>	27	3	30	2.4
<i>Chironomus dorsalis</i>	0	4	4	0.3
<i>Chironomus sp.</i>	2	0	2	0.2
<i>Polypedilum nubifer</i>	21	84	105	8.3
<i>Polypedilum edensis</i>	0	2	2	0.2
<i>Polypedilum ureshinoensis</i>	0	1	1	0.1
<i>Paratendipes sp.</i>	0	2	2	0.1
* <i>Cladopelma viridula</i>	1	0	1	0.1
<i>Cryptotendipes sp.</i>	0	1	1	0.1
* <i>Harnischia curtilamellata</i>	0	1	1	0.1
<i>Pentapedilum parasordens</i>	0	1	1	0.1
Orthoeladinae				
<i>Cricotopus bimaculatus</i>	1	0	1	0.1
<i>Cricotopus bicinctus</i>	1	0	1	0.1
<i>Cricotopus sylvestris</i>	0	3	3	0.2
Tanyponinae				
<i>Tanypus punctipennis</i>	3	5	8	0.6
<i>Procladius choreus</i>	9	0	9	0.7
<i>Ablabesmyia monilis</i>	4	4	8	0.6
Total	581	677	1,258	100

*Unrecorded species in Korea.

Table 4. Collection of chironomidae adults by sweeping on grass along a stream

Species	Number collected
<i>Chironomus kiiensis</i>	10
<i>Chironomus nipponensis</i>	2
<i>Dicrotendipes pelochloris</i>	1
* <i>Dicrotendipes septemmaculatus</i>	2
<i>Tanypus punctipennis</i>	1
Total	16

*Unrecorded species in Korea

were found in Chindo Is., which consisted of more than half of the species recorded from Korea; 43 species, 23 genera were listed in the check list of insects from Korea, published by Entomological Society of Korea and Korean Society of Applied Entomology (1994).

Among 23 species identified, *Cladopelma viridula*, *Dicrotendipes septemmaculatus* and *Harnischia urtilamellata* are reported for the first time in Korea. Two each specimens of *Chironomus* sp. and *Paratendipes* sp. were identified as new species. However, these two species are not described here, because the number of specimens were too small to get firm decision. The genera, *Cladopelma*, *Harnischia* and *Paratendipes* are also first recorded from Korean fauna. It is noteworthy that the species diversity in Chindo Is. was great, even though total number of the non-biting midges collected were unexpectedly small, probably due to the severe draught. More intensive studies will reveal much more unrecorded and/or new species of Chironomidae. Adding unrecorded 3 species and 3 genera, the Korean fauna of Chironomidae consists of 46 species, 26 genera. Three unrecorded species are fully re-described below, with illustrations.

Dicrotendipes septemmaculatus (Becker) (여섯점갈래깔따구, 신칭) (Fig. 1)

Chironomus septemmaculatus Becker, 1908, p. 77.

Dicrotendipes pictipennis: Kieffer, 1913b, p. 23; Freeman, 1955, p. 22.

Dicrotendipes pilosimanus: Kieffer, 1914, p. 262; Freeman, 1955b, p. 372; Sublette and Sublette, 1973, p. 404; Reiss, 1977, p. 93; Reiss, 1978, p. 75; Freeman and Cranston, 1980, p. 190; Reiss, 1986, p. 159; Contreras-Lichtenberg, 1986, p. 716; Chaudhuri and Guha, 1987, p. 27.

Dicrotendipes formosanus: Kieffer, 1916, p. 115; Sublette and Sublette, 1973, p. 403; Hashimoto et al., 1981, p. 12; Sasa and Hasegawa, 1983, p. 320.

Dicrotendipes formosanus var. *lidfrontalis*: Kieffer, 1916, p. 116.

Dicrotendipes speciosus: Kieffer, 1924, p. 256; Kieffer, 1925, p. 299.

Stictochironomus sexnotatus: Goetghebuer, 1930, p. 95.

Chironomus hirtitarsis: Johannsen, 1932, p. 534; Sublette and Sublette, 1973, p. 402.

Polypedilum quatuordecimpunctatum: Goetghebuer, 1936, p. 48.

Chironomus (*Dicrotendipes*) *pilosimanus* (Kieffer): Freeman, 1954b, p. 19; Freeman 1957, p. 360; Freeman, 1961a, p. 247; Freeman, 1961b, p. 694; Dejoux, 1968, p. 56.

Chironomus (*Dicrotendipes*) *pilosimanus* subsp. *quatuordecimpunctatus* (Goetghebuer): Freeman, 1957, p. 361.

Dicrotendipes frontalis Kieffer: Sublette and Sublette, 1973, p. 403.

Dicrotendipes rajasthanii Singh and Kulshrestha, 1977, p. 233.

Dicrotendipes hirtitarsis (Johannsen): Guha et al., 1982, p. 30; Chaudhuri and Guha 1987, p. 27.

Dicrotendipes quatuordecimpunctatus (Goetghebuer): Contreras-Lichtenberg, 1986, p. 710.

Dicrotendipes septemmaculatus (Becker): Cranston and Armitage, 1988, p. 109; Epler, 1988, p. 42; Sasa, 1989, p. 18.

Material examined. Two males, Sokkyo-ri, Imjin-myon, Chindo-gun, Chollanam-do; 23 July 1994, H. I. Ree.

Diagnosis. Medium size, with 6 dark spots on wing. L.R. 1.6. Front femur and tibia yellowish, with

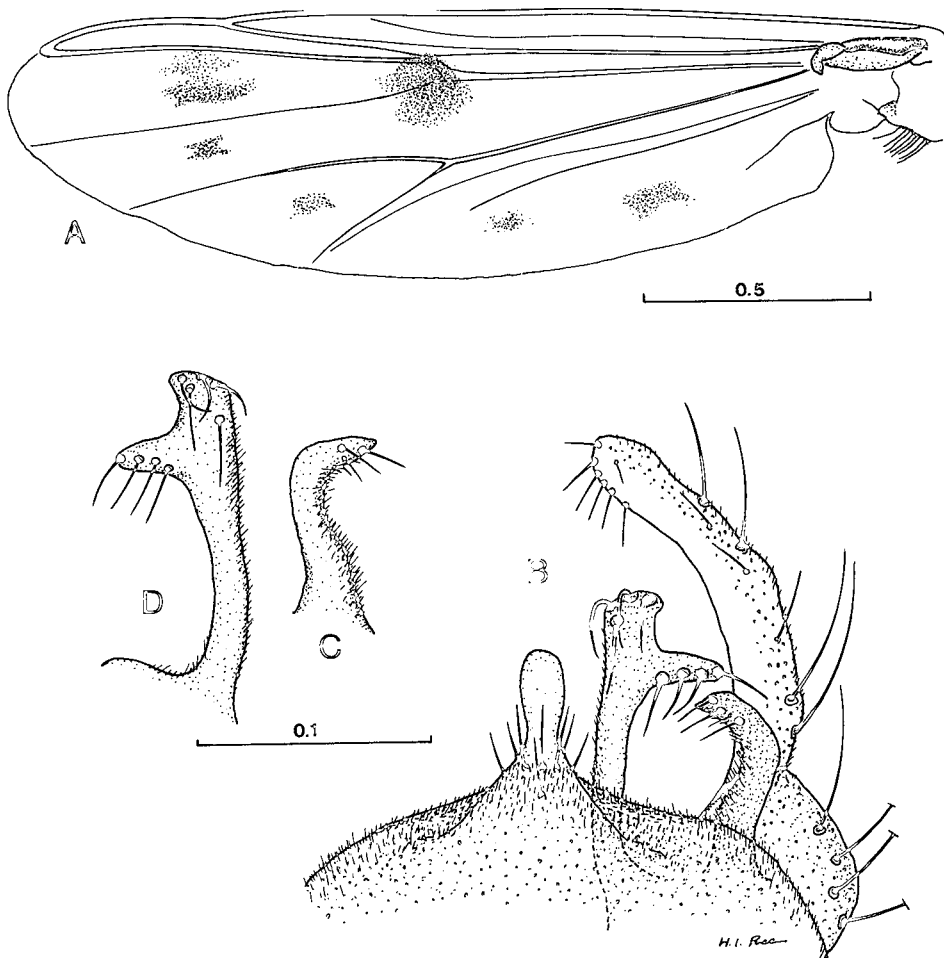


Fig. 1. *Dicotendipes septemaculatus* (male): A, wing; B, hypopygium (dorsal view); C, superior volsella; D, inferior volsella. Scale in mm.

apical dark ring. Inferior volsella deeply bifid at apical portion, each with 4 strong setae. Superior volsella slender, horn-like, deeply curved inward with 3 apical setae.

Description (Male). Head: Eyes black, dorsally produced. Supraorbital setae 25-30 with irregular rows. Frontal tubercles present (44.5 μm long, 22.0 μm wide). Clypeus with 29 long setae, Palp pale dark brown, 4 segmented: 36.8, 126.0, 127.4, 181.7 μm . Antenna pale dark brown, 11 segmented; A.R. 2.1. Thorax: Ground color yellowish. Pronotum developed. Scutum with inconspicuous reddish light brown stripes. Scutellum pale. Middle of postnotum dark brown. Wings (Fig. 1A): Costa not produced. Subcosta ending beyond r-m. R_{2+3} running close to R_1 and ending very close to the tip of R_1 . fCu below r-m. Vannal fold well developed, reaching to the tip of Cu_1 . Anal vein ending below r-m. Anal lobe moderately developed. Squama fringed. Arculus pale. Wing with 6 dark spots: a large spot around r-m, a large one in cell R_{4+5} , a small one in M_{1+2} cell, a small one in M_{3+4} cell and two small ones in anal cell. Front legs: Femur and tibia yellow with an apical dark ring; 1st-2nd tarsi brownish yellow with apical dark ring; 3rd-5th tarsi dark. Mid and hind legs: Femur pale yellow; tibia pale yellow, slightly dark apically; 1st-3rd tarsi yellow, with apical dark ring;

4th-5th tarsi dark brown. Two tibial combs of mid and hind legs contiguous with two short spurs. Abdomen: All segments pulvilli developed. Reddish brown, from 4th to 8th segments darker. Hypopygium (Fig. 1B): Gonostylus smoothly curved inward, parallel sided, with 6 apical setae. Superior volsella (Fig. 1C) slender, horn-like, deeply curved inward with 3 apical setae. Inferior volsella (Fig. 1D) deeply bifid, with 4 sensilla chaetica each on proximal and distal lobes. Anal point bare dorsally, pyriform, deflexed, with 3 dorsal basal setae and 3 lateral basal setae on each side.

Distribution. Cosmopolitan.

Remarks. The genus *Dicrotendipes* was recently revised for the all regions of the world (Epler, 1987, 1988), in which *Dicrotendipes formosanus* Kieffer, 1916, *Chironomus hirtitarsis* Johannsen, 1932, *D. frontalis* Kieffer and *D. rajasthani* Singh and Kulshrestha, and *D. punctatipennis* (Kieffer) as the synonyms of *D. septemmaculatus* (Becker). However, the last one is retained as a separate species for a few characters should be checked and confirmed.

Harnischia curtilamellata (Malloch) (흑무갈따구, 신칭) (Fig. 2)

Chironomus curtilamellatus Malloch, 1915, p. 474.

Chironomus (Harnischia) pseudosimplex: Goetghebeur, 1923, p. 116; Goetghebeur, 1928, p. 87; Goetghebeur, 1937, p. 49; Edwards, 1929, p. 390.

Chironomus (Chironomus) curtilamellata: Miller, 1941, p. 20.

Harnischia (Harnischia) curtilamellata: Townes, 1945, p. 166; Johannsen and Townes, 1952p. 100.

Harnischia curtilamellata: Pinder, 1978, p. 124, fig. 156; Sasa and Kikuchi, 1986, p. 20; Sasa and Kawai, 1987, p. 18.

Material examined. One male, Sammak-ri, Uishin-myon, Chindo-gun, Chollanam-do; 24 July 1994, H. I. Ree.

Diagnosis. Medium sized, ocher yellow midges. A.R.: 2.1. Superior volsella very weak, pubescent, lobe-like, with 3 setae. Gonostylus parallel-sided, slightly bent inward, fused with gonocoxite. Anal point with 6-7 lateral setae each side.

Description (Male). Head: Eyes produced dorsally. Antenna dark brown, 11 segmented; A.R. 2.1; pedicel brown. Supraorbital setae 11-12 on both sides. Palp 4 segmented: 37.8, 131.0, 106.4, 156 μ m. Frontal tubercle extremely minute (Fig. 2C). Thorax: Ground color ocher yellow. Pronotum pale, well developed. Scutum yellowish, with inconspicuous orange yellow vittae. Scutellum pale, with 8 setae in a row. Postnotum orange yellow. Halter pale. Wings (Fig. 2A): Wing length 1.6 mm. Cost not produced. Subcost ending beyond r-m. R_{2+3} ending well beyond the tip of R_1 . r-m pale, oblique. fCu slightly beyond r-m. Vannal fold almost reaching to the end of Cu_1 . Anal vein ending before fCu, just below r-m. Anal lobe well developed. Squama fringed. Arculus pale dark brown. Brachiolum with 2 sensilla campaniformia. Legs: Front legs pale dark brown, with pale green femur; mid and hind legs pale green with dark brown 4th tarsi and darker 5th tarsi. Combs of mid and hind tibiae contiguous, each with a short spur. Pulvilli well developed. Abdomen: All segments pale green, except 7th segment brownish. Hypopygium (Fig. 2B): Anal point, bare dorsally, long and wide, parallel-sided, tapering apically, with 6-7 lateral setae each side. Superior volsella very weak, pubescent, lobe-like (conical), with 3 setae. Inferior volsella absent. Gonostylus long, rather wide, parallel-sided, slightly bent inward, fused with gonocoxite.

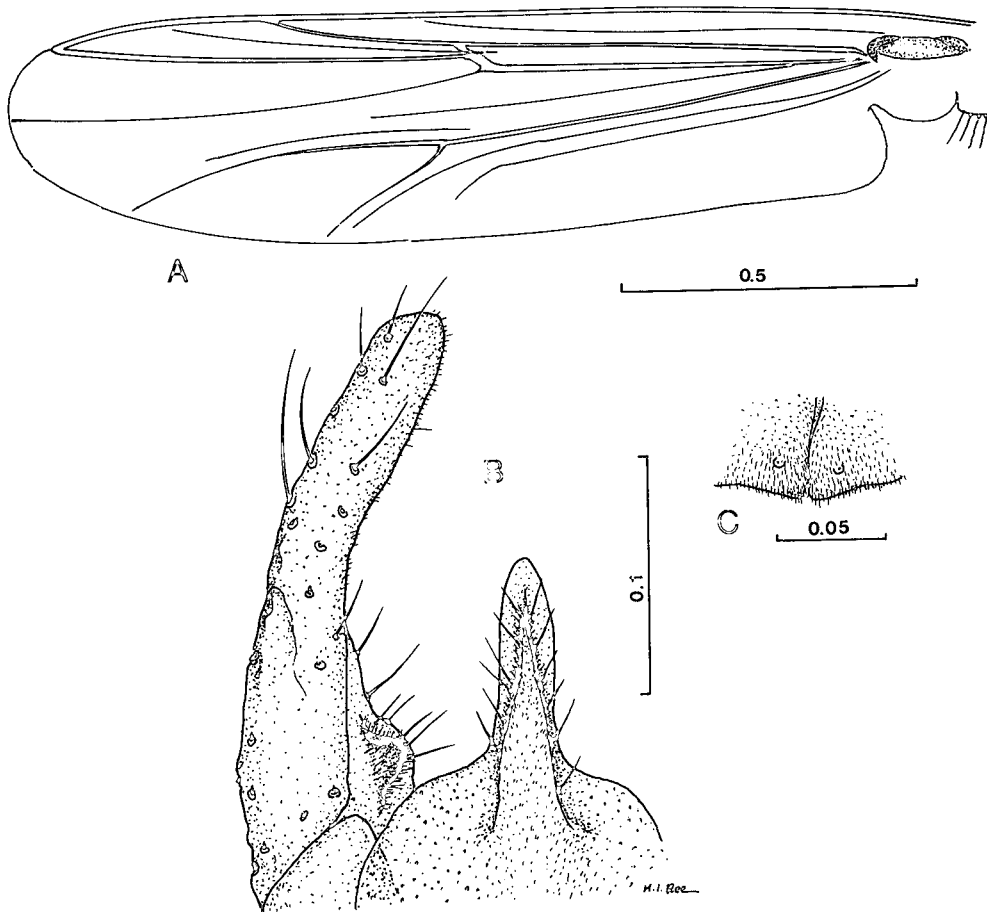


Fig. 2. *Harnischia cultilamellata* (male): A, wing; B, hypopygium; C, frontal tubercle. Scale in mm.

Distribution. U.S.A., Europe (France, England, Belgium), Japan.

Remarks. It is interesting to find that the antennal ratio (A.R.) of this species were differently described by previous workers, i.e. 1.8-1.9 by Edwards, 1929 (from England), 2.6 by Johannsen and Townes, 1952 (from North America), 2.1 by Sasa and Kikuchi, 1986 (from Tokushima, Japan), and 3.0 by Sasa and Kawai (from Shiga, Japan). A.R. of our specimen was 2.1, which is well coincide with that of the specimen from Tokushima, Japan. The body size of our specimens is much smaller (1.6 mm) than that of the North American specimens (2.3 mm), whereas that of the Japan specimens (1.8 mm) is similar to ours.

Cladopelma viridula (Linnaeus) (녹색사촌무갈따구, 신칭) (Fig. 3)

Tipula viridula Linnaeus, 1767, p. 975.

Chironomus (*Chironomus*) *viridulus*: Edwards, 1929, p. 390.

Chironomus (*Cryptochironomus*) *viridulus*: Goetghebuer, 1937, p. 49; Tokunaga, 1940, p. 301.

Harnischia (*Harnischia*) *viridulus*: Townes, 1945, p. 168.

Cryptocladopelma viridula: Pinder, 1978, p. 118.

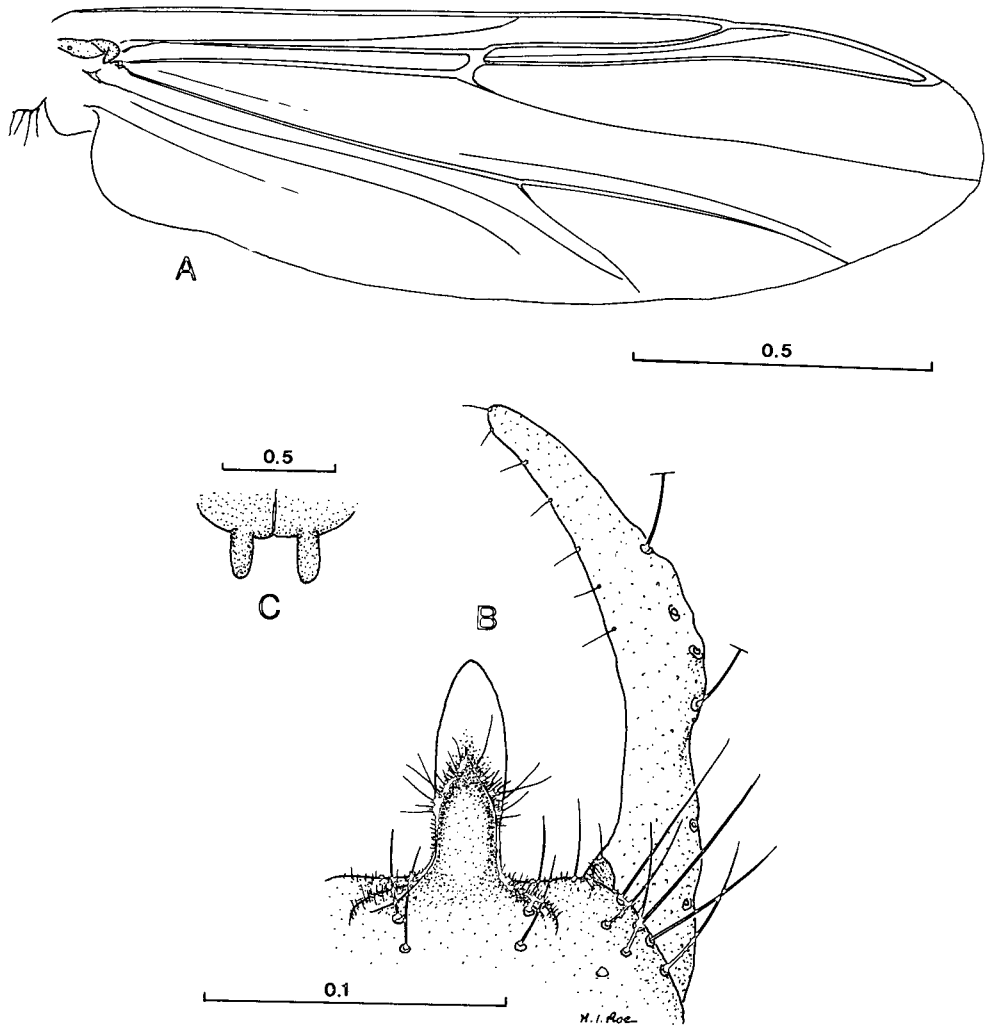


Fig. 3. *Cladopelm viridula* (male): A, wing; B, hypopygium; C, frontal tubercle. Scale in mm.

Harnischia viridula: Hashimoto *et al.*, 1981, p. 21; Sasa and Hasegawa, 1983, p. 324; Sasa, 1985, p. 35.

Material examined. One male, Sokhyon-ri, Kogun-myon, Chindo-gun, Chollanam-do; 23 July 1994, H. I. Ree.

Diagnosis. Small to medium sized, light green midges. L.R. 1.7, A.R. 1.9. Gonostylus long, narrow, tapered apically, slightly concave inner margin, fused with gonocoxite. Superior volsella very small tubercle-like, with a small seta. Inferior volsella absent.

Description (Male). Head: Eyes black, dorsally produced; Antenna 11 segmented; A.R. 1.9; Clypeus rectangular, with 9-10 setae. Supraorbital setae 6-7 on both sides. Palp 4 segmented: 28.4, 70.9, 127.7, 141.8 μ m. Frontal tubercle small (16.5 μ long, 11.8 μ wide). Thorax: Central and lateral vittae light brown, with inconspicuous margin. Halter pale. Autepronotum moderately developed. Wing (Fig. 3A): Wing length 1.6 mm. R_{2+3} ending near to tip of R_1 . R_{4+5} well beyond tip of Cu_1 . fCu just beyond r-m. Anal vein ending just beyond fCu. Anal lobe moderate. Squama with 4

setae. Front legs: Femur yellow, tibia and all tarsi dark. Mid and hind legs: Femur, tibia and 1st-3rd tarsi pale green, 4th tarsus slightly dark, 5th tarsus darker. Middle and hind tibial combs fused, each with short spur. L.R. 1.7. Pulvilli developed, claw slightly curved at tip. Abdomen: All segments green. Hypopygium (Fig. 3B): Gonostylus long, narrow, tapered apically, slightly concave inner margin, with 5-6 small interlateral setae, completely fused with gonocoxite at base. Anal point with hyaline dorsal surface and setigerous ventral keel, setose dorsolaterally. Superior volsella highly reduced to a small pubescent tubercle with a small seta. Inferior volsella absent. Ninth tergite with long setae on both side of anal point at base and along lateral margins.

Distribution. Europe, U.S.A., Japan

Remarks. It was confusing to identify the specimens collected in Chindo, because *viridula*, *edwardsi* and *viriscens* are morphologically very similar each other, and the earlier workers very briefly and differently described and roughly illustrated the above three species. Goetghebuer (1928), Edwards (1929) and Townes (1945) described that *virescens* had uniformly green abdomen, whereas *viridula* had green abdomen with last three tergites dark. Edwards (1929) also stated that there was no trace of appendages (volsella) in *viridula*, whereas appendage 1 (superior volsella) was just distinguishable. Our specimens had completely green abdomen and small rod-like superior volsella, which coincide with *virescens*. However Pinder (1978) illustrated clearly distinguishable superior volsella in *viridula*, *virescens* and *edwardsi*, and he stated that *virescens* had anal point flanked basally by a pair of swellings bearing numerous strong setae. As the anal point is not as above, our specimens do not belong to *virescens*. Pinders (1978) differentiated *viridula* and *edwardsi* by the shape of inner margin of gonostylus, i.e. inner margin of gonostylus somewhat swollen in basal half in *viridula*, whereas that of *edwardsi* smoothly curved, not swollen basally. If it is a reliable character, our specimens belong to *edwardsi*. The description and illustration of *Tendipes (Parachironomus) edwardsi* n. sp. by Kruseman (1933) was brief and simple (only 43 words). Sasa and Hasegawa (1983) reported *Harnischia viridula* (Linnaeus) from Japan, and they fully redescribed in detail, which were completely identical to our specimens. The authors decided to treat our specimens tentatively as *viridula*, until the type specimens of these three species are compared with our specimens.

Biting midges (Insecta: Diptera: Ceratopogonidae)

The result of biting midge collections by light trap is shown in Table 5. Total 97 females and one male were collected and five species were identified: *Culicoides punctatus*, *C. arakawai*, *C. circumscriptus*, *C. maculatus* and *Foreipomia* sp. Among five species, *C. punctatus* was predominant occupying 88.7% of the total. Two females of the genus *Foreipomia* collected seemed to be new, at least in Korea. *C. circumscriptus* is rather rare species and has been reported in the middle of the Korean peninsula, therefore the collection in Chindo is the first finding in the south of the peninsula. *C. punctatus* was reported for the first time from Korea by Lee (1993). She found that *C. punctatus* and *C. arakawai* were most widely distributed with high density throughout the country.

Cockroaches (Insecta: Blattaria)

Total 120 sticky traps were set up in a super market, a fruit shop, a mill house, a hotel kitchen,

Table 5. Collections of biting midges by a light trap in Chindo Island on 22-23 July 1994

Species	Chinsol-ri (22 July)	Sammak-ri (23 July)	Total
<i>Culicoides punctatus</i>	52	34	86
<i>Culicoides arakawai</i>	5 (1)*	0	5 (1)
<i>Culicoides curcumscriptus</i>	1	0	1
<i>Culicoides maculatus</i>	0	3	3
<i>Foreipomia</i> sp.	0	2	2
Total	58 (1)	39	97 (1)

* (): Number of males

hotell rooms and a restaurant for 3 days. Only a male adult and 3 nymphs of *Periplaneta japonica* and 3 nymphs of *Periplaneta americana* were collected. It was unexpected result that the population density of domiciliary cockroaches was very low (0.019 roaches/trap/day) and *Blattella germanica* was not collected at all, because *B. germanica* is the most predominant species and widely distributed throughout the country (Ree *et al.*, 1973, 1976). It was also suprising to find that *P. japonica* seems to be dominant in this southern most island, as this species is well adapted to cold climate and more commonly found in the middle of the Korean peninsula.

Field rodents and ectoparasites

Two day collections with 98 Sherman traps resulted 45 *Apodemus agrarius* and 2 *Crociidiula lasiura*, showing 23.0% and 1.0% of trap rates, respectively. The ectoparasites infesting on *A. agrarius* were 6 *Leptotrombidium orientale* larvae (Acarina: Prostigmata: Trombiculidae), 24 *Ixodes nipponensis* larvae and nymphs (Acarina: Metastigmata: Ixodidae), 89 *Laelaps jettmani* nymphs and adults and 12 *Eulaelaps stabularis* nymphs and adults (Acarina: Mesostigmata: Laelapidae), 4 fleas (Insecta: Siphonaptera), and 3 sucking lice (Insecta: Anoplura). Three adults of *Haemophysalis longicornis* (Acarina: Metastigmata: Ixodidae) was collected from a cow.

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전남 진도의 위생 절지동물상

이한일 · 이원자* · 이인용 · 전성후
(연세대학교 열대의학연구소: *국립보건원 기생충과)

요 약

1994년 7월 전라남도 진도에서 위생절지동물상을 조사하였다. 모기는 8종이 채집되었는데 그중 일본뇌염 매개종인 작은빨간집모기(*Culex tritaeniorhynchus*)가 우점종이었다. 신충으로 보이는 *Culex* sp. 유충이 채집되었는데 명명은 성충이 채집되지 않아 보류하였다. 깔따구는 모두 11속 23종이 채집되었는데 그 중 *Cladopelma viridula*(녹색사촌무깔따구, 신칭), *Dicrotendipes septemmaculatus*(여섯점갈래깔따구, 신칭) 및 *Harnischia urtilamellata*(흑무깔따구, 신칭)는 한국 미기록종이어서 자세히 재기재하였다. 깔따구류중 우점종은 안개무늬날개깔따구(*Chironomus kiiensis*)이었고(67.3%), 노란털깔따구(*Ch. flaviplumus*)가 그 다음이었다(15.6%). 등메모기는 모두 5종이 채집되었고 그중 *Culicoides punctatus*가 88.7%로 우점종이었다. *Foreipomia* sp.도 채집되었는데 이 속은 한국에서 처음으로 기록되는 것이다. 들쥐 채집결과는 등줄쥐(*Apodemus agrarius*)가 높은 밀도를 보였고 등줄쥐에 기생하는 외부기생 절지동물로 *Leptotrombidium orientale*, *Ixodes nipponensis*, *Laelaps jettmani*, *Eulaelaps stabularis* 등이 동정되었다.