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A New Species of the Genus *Cricotopus* (Diptera: Chironomidae), a Pest of Rice in Seosan, Korea

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We found some larvae of non-biting midges (Diptera: Chironomidae) that injured rice crops by feeding on seeds and/or roots in the reclaimed rice fields in Seosan, Chungchongnam-do, Korea, in May 1997. Four instar larvae were collected and reared in the laboratory. This pest species of the rice plant was identified as a new species of *Cricotopus*, similar to *C. sylvestris*. The main differences are the color pattern of the abdominal tergites. Both adult and immature stages of the new species are described with illustrations.

It is known that some chironomid larvae are pests of rice crops in some countries. *Cricotopus sylvestris* was reported as a rice pest in California, U.S. (Darby, 1962; Lange and Grigarick, 1970). Jones (1968) reported that *Chironomus tepperi* was a principal species associated with rice crop damage in New South Wales, and Stevens (1994) confirmed that the larval stage of this species was the most serious pest affecting aerially sown rice crops by feeding on roots or endosperms of the seed. Noda et al. (1986) observed that many leaves of the rice plant floated on water in both directly sown and transplanted rice crops, and found that *Cricotopus trifasciatus* was the main pest species.

We found that larvae of the chironomid midges were associated with serious rice crop damage in aerially sown rice fields in Seosan, Korea in May 1997, and that they belong to a new species of the genus *Cricotopus* (Diptera: Chironomidae).

Materials and Methods

Four instar larvae injuring rice roots were collected and reared in the laboratory. Temperature and relative humidity were maintained at 25±3℃ and 60-80%, respectively, and the colony had been maintained up to the second generation. Some larvae, pupae and adults were mounted on slides with Hoyer's solution for identification. Both adult and immature stages are described with illustrations. The length of the wing representing the size of the body was measured from the apex to the arculus. Each life stage was also observed. Terminology for the chironomid morphology is after Saether (1980). The type series are deposited in the Department of Parasitology, College of Medicine, Yonsei University, Seoul, Korea.

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Descriptions

Cricolopus oryzaphagos sp. nov.*
(Figs. 1, 2)

Material examined

Holotype: 1♂ (R-S-4034, slide-mounted), Chang-ri, Buseok-myon, Seosan-si, Chungchongnam-do, 26 May 1997 (J. Y. Kim). Paratypes: 17♂♂, 11♀♀, same data as holotype.

Diagnosis

The wing length of the male was 1.48±0.04 mm. A.R. 1.52±0.04; L.R. 0.55±0.01. Tergites II-IV were pale yellow, each with a distinct dark marking in the middle. Antepronotal was absent. 8-9 rather weakly developed scutallars in a single row. Thoracic horn of pupa brown, tube-like, tapered ventrally. Antennae of larva 5, segmented, with a blade as long as segment III-V. Mentum of larva with 1 median and 5 pairs of lateral teeth.

Etymology

The specific name is from the Latin *oryza,* rice, and *phagos,* voracious eating, referring to the larval feeding habit of this new species.

Description

Male (n=10): HEAD (Fig. 1B): Light brown. Eye black,

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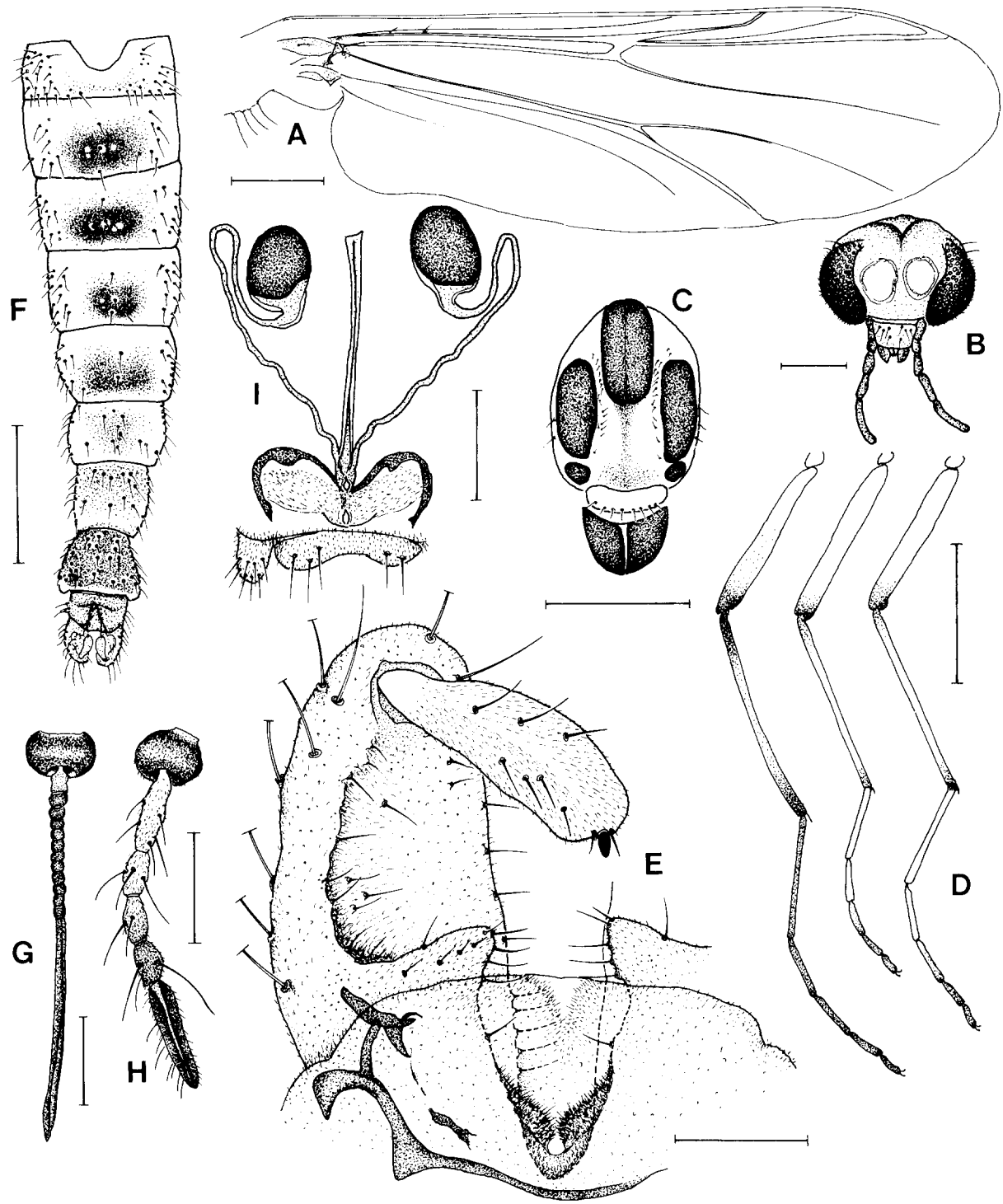

Fig. 1. *Cricotopus oryzaphagos* sp. nov. (A-G, male; H, I, female). A, Wing. B, Head (frontal). C, Thorax (dorsal). D, Legs (front, mid, and hind from left). E and I, Genitalia (dorsal). F, Abdomen (dorsal). G and H, Antenna. Scale bars=0.05 mm (E), 0.1 mm (H, I), 0.2 mm (A, B, G), and 0.5 mm (C, D, F).

reniform, highly pubescent. Antenna (Fig. 1G) dark brown, 14 segmented, apex not swollen but tapered; A.R. 1.52±0.04. Palp pale brown, 4 segmented: 41.9 ±3.8, 80.5±5.4, 101.6±3.7, 147.0±7.2 μm (1:1.9: 2.4:3.5). Clypeus pale brown, with 8 setae. Orbitals, frontals and inner verticals absent; an outer vertical

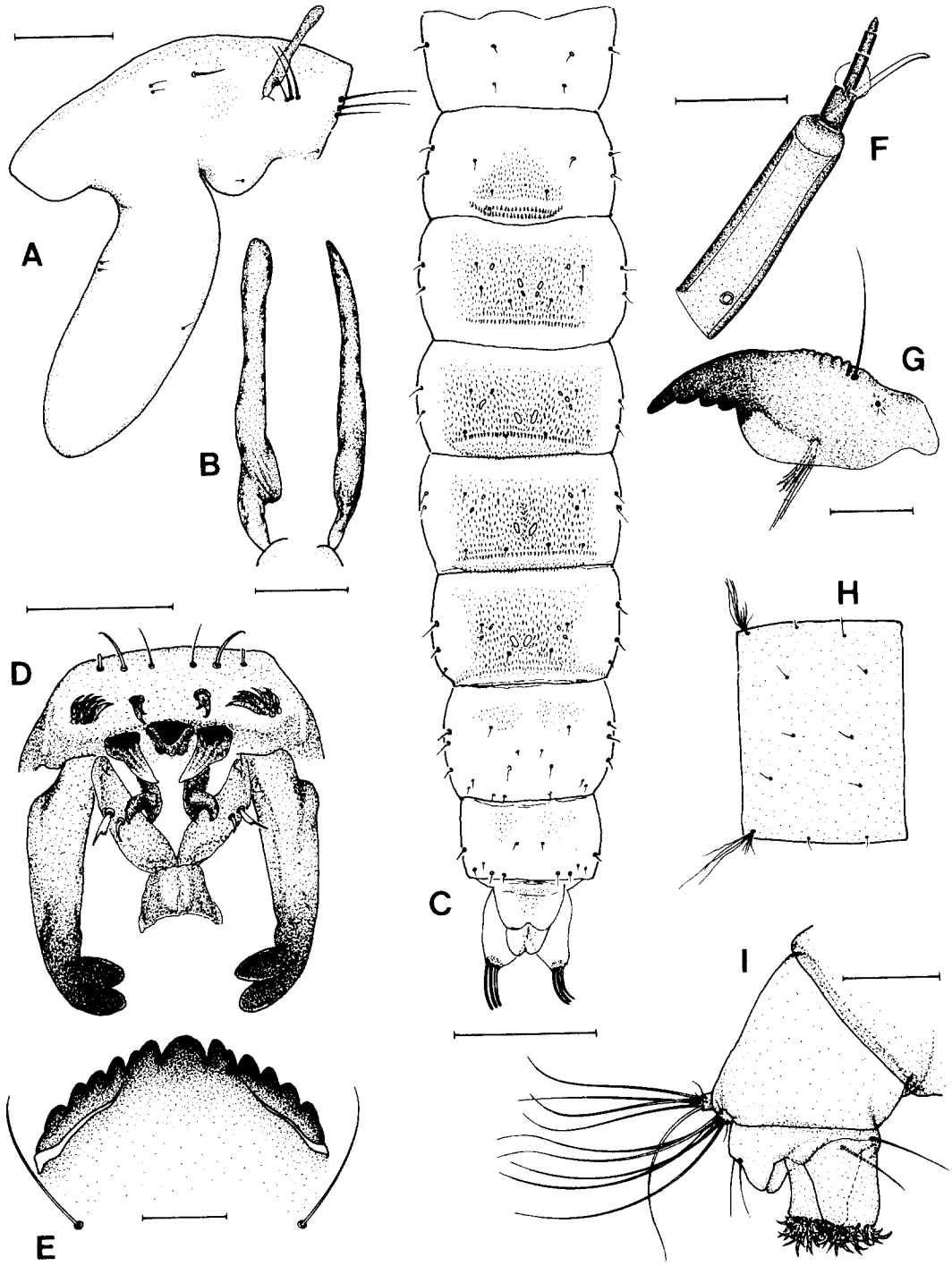

Fig. 2. *Cricotopus oryzaphagos* sp. nov. (A-C, pupa; D-I, larva). A, Thorax (lateral). B, Thoracic horn (left: lateral, light: ventral). C, Abdominal tergites. D, Paratal surface of labrum. E, Mentum. F, Antenna. G, Mandible. H, Abdominal segment IV (lateral); I, anal end. Scale bars=0.01 mm (B), 0.05 mm (D, E, G), 0.2 mm (I), 0.3 mm (A, F), and 0.5 mm (C).

seta present. THORAX (Fig. 1C): Yellowish light brown in ground color. Antepronotum well-developed, reaching each other, without antepronotals. Scutum with 8-9 acrosticals and 18-20 dorsocentrals, all minute and decumbent; central and lateral vittae distinct, dark brown. Scutellum pale yellow, with 8 or 9 rather short,

weak scutellars in a single row. Postnotum dark brown. Halter pale. WING (Fig. 1A): 1.48±0.004 mm long. Membrane bare, transparent and weak (fragile). Veins pale. Brachiolum pale yellow with 1 hair. Costa not produced. R_{2+3} ending about midway between tips of R_1 and R_{4+5}. R with 2 minute hairs. FCu slightly distal to r-m. Cu_1 almost straight. Anal lobe produced. Alula moderately developed. Squama fringed. LEGS (Fig. 1D): Femora pale, with apical end dark brown. Front tibia dark brown, with yellowish broad ring in the middle; mid and hind tibiae pale, with a dark distal end. All front tarsi dark brown; mid and hind tarsi pale, with the distal half of III and IV-V dark brown. One long spur on front tibia, 2 short spurs on mid tibia, 1 long spur and comb on hind tibia. Pulvilli small. Measurements of leg segments shown in Table 1. ABDOMEN (Fig. 1F): Tergite I pale yellow; II-V pale yellow with distinct, large dark brown spot in the middle; VI pale yellow, with obscured yellowish brown marking in the middle; VII largely yellowish brown; VIII brown. Tergites II-IV with 2-4 median setae and 7-12 (9.8 in average) lateral setae on each side. HYPOPYGIUM (Fig. 1E): Anal point absent. Tergite IX yellowish brown, highly setigerous. Gonocoxite pale; inferior volsella simple, apex rather round, bearing 10-12 setae irregularly; inner margin of gonocoxite more or less straight. Gonostylus simple, expanded distally, highly setigerous, with 1 stout spine apically.

Female (n=10): All characters, in general, same as in male, with usual sexual differences. Wing length 1.47 ±0.05 mm. Antenna (Fig. 1H) with 5 flagellomeres: 77.9±1.4, 41.7±2.2, 40.4±1.6, 39.4±0.8, 111.7± 8.6 μm; pedestal brown, proximal half of 1st flagellomere pale and the rest light brown, 2nd-5th flagellomeres brown. GENITALIA (Fig. 1I): Tergite X simple, bearing two groups of 2 or 3 (mostly 3) strong setae. Gonocoxite IX well developed, with 15-17 setae. Seminal capsule round to ovoid, pigmented (dark brown), with neck. Spermathecal duct long, stongly and irregularly bent. Cerci large.

Pupa (n=10): Total length 4.7±0.39 mm. THORAX (Fig. 2A): 3 median antepronotals; 1 lateral antepronotal; 1 prealar; 3 dorsocentrals; 3 precorneals (1 and 2 equal in length and 3 shorter). Thoracic horn (Fig. 2B) brown, simple, tubelike, without spinules, tapered ventrally; 354±23 μm in length. ABDOMEN (Fig. 2C): Tergite I bare; all other tergites covered with fine spines, except bare lateral and frontal margins; tergite II with a prominent central spine patch along the posterior margin; tergites III-IV with weak spine patch along the posterior margin. Pedes spurii A and B absent. Anal fringe absent. Three anal macrosetae stout, equal in length. Setae D_1, D_4, D_5, L_1, L_2 present.

Larva (n=10): Milky white body with dark brown head capsule. Total length 5.9±0.58 mm. HEAD: 0.55± 0.03 mm long and 0.38±0.025 mm wide. Antenna (Fig. 2F) 5-segmented (678, 109, 95, 61, 41 μm in length), with blade almost as long as the last 3 segments; a ring organ on basal 1/5 of segment I present; vestigial lauterborn organ present; a tiny peg sensillum present. Mentum (Fig. 2E) darkened with 1 median and 5 pairs of lateral teeth, first inner pair with sub-tooth (bifid); seta submenti simple, long (about 0.1 mm); ventromental plate extremely narrow. Mandible (Fig. 2G) with 1 long apical and 3 short inner teeth; seta interna with 6 finely serrated branches. Labrum as illustrated in Fig. 2D; S1 bifid, S2 simple and stout, S3 short and fine, S4 short with blunt tip; labral lamella absent; chaetulae basales short, simple; pecten epipharyngis stout, short; paralingula stout, long, with 2 blunt, subequal teeth apically. BODY: Anterior parapods separate, each with an apical crown of claws. Anal end of the body as shown in Fig. 2 I; posterior parapods separate, each with an apical group of bifid claws; procercus about as high as wide, bearing 5 long anal setae; anal tubules very short (shorter than posterior parapods), bearing a single seta on dorso-basal portion. Abdominal segments (Fig. 2H) with a pair of setal tufts (one dorsally and the other ventrally) and small simple setae (D_1, D_2, D_4, D_5, V_1, V_2, V_4, V_5, L_1, L_3) present.

Life cycle

The eggs are laid in a gelatinous matrix. The egg mass was an elongate, cylindrical (about 3 cm long), with about 300 eggs arranged linearly in a single row. The egg was milky white, and about 0.2 mm long. The incubation period of the eggs was 1-2 d. The larval stage with 1st-4th instars lasted 20.1±2.8 d at 25℃, and the adults emerged about one d after pupation.

Table 1. Measurement (in μm)* of the leg segments of male specimens of *Cricotopus oryzaphagos* sp. nov.

	Fore Leg	Mid Leg	Hind Leg
Femur	619±16 (603-648)	616±17 (584-641)	607±19 (575-637)
Tibia	793±30 (742-836)	653±35 (575-684)	758±27 (705-790)
Tarsus I	440±15 (419-456)	277±11 (265-297)	386± 9 (372-401)
Tarsus II	222± 4 (215-228)	160± 5 (151-170)	203± 7 (196-215)
Tarsus III	181± 6 (172-188)	131± 7 (115-140)	178± 8 (162-188)
Tarsus IV	135± 4 (130-144)	92± 6 (84-103)	99± 7 (90- 94)
Tarsus V	103± 9 (89-117)	94± 5 (85-102)	101± 5 (94-106)
Leg ratio	0.55±0.01	0.43±0.02	0.51±0.01

* Average±S.D. (min.-max.); n=10

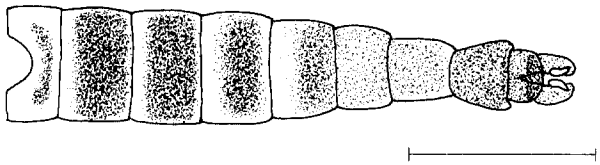

Fig. 3. Dark form of a male abdomen of *Cricotopus oryzaphagos* sp. nov. (dorsal view). Scale bar=0.2 mm.

The life span of the adults was 3-7 d.

Taxonomic discussion

There were light and dark types in adult body color. When larvae were reared at low temperature (below 20℃) the adults became darker, but under a high temperature condition (25℃ or higher) the light form emerged. In nature, both light and dark forms were observed. In the dark type adults, the middle pale ring of the first tibia was obscured, and the abodominal tergites II-VIII were almost completely dark brown with pale margins on the tergite of II-IV (Fig. 3). The dark and light types were also observed in *Cricotopus sylvestris* (Hirvenoja, 1973; Sasa, 1979), *Chironomus nipponensis* (Hashimoto, 1977), and *Chironomus plumosus* (Sasa, 1978).

Cricotopus oryzaphagos sp. nov. is very similar to *Cricotopus sylvestris* which is widely distributed not only in Korea but in other parts of the World. The main differences are: (1) the 2nd and 3rd tergites of the former are pale in ground color with a dark spot in the middle (there are peripheral pale patches even in the dark form), whereas those of the latter are almost completely dark even in the light form; (2) antepronotal setae are absent in the former, whereas several setae are present in the latter; (3) scutellar setae of the former are weaker and shorter than those of the latter; (4) mandible of the larva has one simple seta in the former whereas the latter two; (5) anal gills of the larva of the former are shorter than those of the latter. Antennal ratio (A.R.) of *C. sylvestris* differed depending or authors: 1.32 ± 0.06 (Ree and Kim, 1981), 1.41-1.77 (1.58 in average; Hirvenoja, 1973), and 1.38-1.52 (1.45 in average; Sasa, 1979). A.R. of *C. oryzaphagos* was 1.52 ± 0.04.

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