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I apologize for my neglect.

Yeon Jae Bae

The Classification of the Ephemerellidae (Ephemeroptera) in Korea

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ABSTRACT

We reviewed twelve species of Korean Ephemerellidae based on the specimens which were collected at about 120 localities in South Korea during 1965~1985. All larval stages and seven adult stages were summarized with illustrations and larval identification key. Some closely related species were grouped with taxonomic discussion. The species were rearranged by Allen's (1980) Ephemerellidae classification system. We gave a new name to *Ephemerella nba*, which was first recognized by Imanishi (1940) as a species native to Korea, as *Ephemerella notofascia* n. sp.

Key Words : Ephemeroptera, Ephemerellidae, Classification, Korea

INTRODUCTION

The Ephemerellidae is one of the most diverse groups among Ephemeroptera, which is widely distributed on the continents. The family, which was first recognized by Eaton (1883~88), includes three subfamilies-Ephemerellinae Klapálek (1909), Melanemerellinae Ulmer (1919), and Teloganodinae Allen (1965). The Ephemerellinae is most abundant in the Holarctic and Oriental realms (Allen, 1965, 1980, 1984; Edmunds et al., 1976; McCafferty & Edmunds, 1979). The Ephemerellidae was assigned to an independent superfamily Ephemerelloidea in the Pannota together the Tricorythidae (McCafferty & Edmunds, 1979), however, the higher classification was considered paraphyletic (McCafferty & Edmunds, 1979).

There are several generic classifications of the Ephemerellidae. Edmunds (1959) succeeded Eaton's (1883~88) generic concept of *Ephemerella* and adopted subgeneric concept into Ephemerellidae classification. Recently, Allen (1980, 1984) reevaluated previous Ephemerellidae subgenera and gave most generic rank. Since Allen's (1980, 1984) generic classifications were mainly based on phenetic similarities of larval stages and on geographic evidence, without any phylogenetic evidence (Allen & Brusca, 1973; Allen, 1980), the stability of the generic ranks is relatively weak.

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The Korean Ephemerellidae larvae have been recorded by Imanishi (1940), Allen (1971, 1975), and Yoon & Kim (1981). Imanishi's (1940) descriptions of the larvae of the seventeen Ephemerellidae species were largely based on the specimens from the wide range of Eastern Asia, e.g., Korea, Manchuria, Mongolia, and Japan; ^{twelve} ~~eleven~~ species were recorded from Korea: *Ephemerella basalis* (= *Drunella basalis* (Imanishi)), *E. basalis* na (= *D. aculea*), *E. nG* (= *D. cryptomeria*), *E. trispina* na (= *D. triacantha*), *E. trispina* naa (= *D. trispina ezoensis* (Gose)), *E. nM* (= *D. longipes*), *E. nF* (= *E. imanishii*), *E. nN* (= *E. taeniata* Tshernova), *E. nba* (= *E. notofascia* n. sp.), *E. longicaudata* (= *Acerella longicaudata*), *E. rufa* (= *Serratella rufa*), and *E. nax* (= *Cincticostella* ^{shernovae}). Since most of Imanishi's (1940) species were invalid in nomenclature, some of them were renamed, synonymized, or reviewed (Tshernova, 1952; Bajkova, 1962, 1967, 1972; Allen, 1971, 1975; Yoon & Kim, 1981); others remain undeciphered. Allen (1971) added two new Ephemerellidae species from Korea: *E. (Cincticostella) castanea* (= *C. castanea*) and *E. (Ephemerella) keijoensis* (= *E. keijoensis*). Most recently, Yoon & Kim (1981) reviewed Korean Ephemerellidae larvae, and confirmed eight species from either Imanishi's (1940) or Allen's (1971, 1975) records: *E. (D.) bicornis* (= *D. longipes*), *E. (D.) aculea* (= *D. aculea*), *E. (D.) cryptomeria* (= *D. cryptomeria*), *E. (D.) trispina* (= *D. triacantha*), *E. (C.) castanea* (= *C. castanea*), *E. (E.) imanishii* (= *E. imanishii*), *E. (S.) setigera* (= *S. setigera*), and *E. (S.) rufa* (= *S. rufa*).

In the present study, we review twelve Korean Ephemerellidae species, and rearrange them based on Allen's (1980) Ephemerellidae generic classification system. The taxonomic relationships among the species from the vicinal regions to Korea, e.g., Japan, Manchuria, China, and Eastern Siberia, are discussed, but mostly remain unknown because no materials were available from these regions. We group some closely related species into tentative groupings for the further classification. It is very possible that some of the species within the groupings will eventually fall into synonymy. The specimens were collected at about 120 localities in South Korea during 1965~1985. All specimens were preserved in alcohol and deposited at Korean Entomological Institute, Korea University, Seoul, Korea.

SYSTEMATICS

Family Ephemerellidae Klapálek, 1909

Type genus: *Ephemerella* Walsh, 1862

Diagnosis. *Adult.* Fore wings veins MP 2 and CuA little divergent; with short, basally detached marginal veinlets along outer margin; costal cross veins reduced. In Ephemerellinae, basal segment of genital forceps less than one-half as long as 2nd segment. **Larva.** Notum fused between fore wing pads. Bilamellate gills on abdominal segment 3~7 or 4~7, sometimes on 2~5 or 2~6. Sometimes rudimentary gills on abdominal segment 1. Three or two caudal filaments. In Ephemerellinae, bilamellate gills on abdominal segment 3-7 or 4-7; three caudal filaments.

Genus *Drunella* Needham, 1905

Drunella Needham, 1905: 42; Edmunds, 1959: 546; Allen & Edmunds, 1962:147; Allen 1980:

Type species: *D. grandis* (Eaton)

Type locality: North America

Diagnosis. *Adult.* Genital forceps bow-like; round; terminal segment 2~3 times as long as broad. Penis without tubercles, lobes, or spines; with ventral notch (Figs. 3, 7). *Larva.* Bilamellate gills on abdominal terga 3~7. Fore femora with tubercles on ventral (leading) edge. Caudal filaments subequal; with fringed lateral setae (dorsal setae in *D. longipes* group).

Distribution. Holarctic, Oriental

Remarks. Several species of the *Drunella* have been recorded from Eastern Asia, including Korea, Manchuria, Eastern Siberia, and Japan. We suggest tentative groupings for the *Drunella* from these regions based on the characters of Korean *Drunella* larvae.

D. aculea group: *D. basalis* (Imanishi, 1940; *Ephemerella basalis* na (Imanishi, 1940) (= *D. aculea* (Allen), 1971)-- 1) three clypeal tubercles present; median ocellar tubercle shorter than lateral clypeal tubercles (Fig. 1), 2) clypeal edge with submedian tubercles (Fig. 1), 3) tubercles on ventral fore femora and apical fore tibia well developed (Fig. 1), 4) submedian tubercles on abdominal terga well developed, moderate, or rudimentary, and 5) caudal filaments with whorls of setae at end of each segment; with lateral intersegmental setae.

D. triacantha group: *D. trispina* (Ueno, 1928; *E. trispina* na (Imanishi, 1940) (= *D. triacantha* (Tshernova), 1949); *E. trispina* naa (= *D. trispina ezoensis* (Gose), 1980)-- 1) three clypeal tubercles subequal (Fig. 6), 2) clypeal edge round (Fig. 6), 3) tubercles on ventral fore femora and apical fore tibia well developed, and 4) caudal filaments with whorls of setae at end of each segment; with lateral intersegmental setae.

D. cryptomeria group: *D. cryptomeria* (Ueno, 1928-- 1) three clypeal tubercles subequal (Fig. 10), 2) clypeal edge notched (Fig. 10), 3) tubercles on ventral fore femora and apical fore tibia well developed (Fig. 11), 4) fore femora with ridges on dorsal surface (Fig. 11), and 5) caudal filaments with whorls of setae at end of each segment.

D. longipes group: *D. longipes* (Tshernova), 1952; *D. lepnevae* (Tshernova), 1949; *D. bicornis* (Gose), 1980-- 1) clypeal tubercles absent; paired occipital tubercles present (Fig. 12), 2) tubercles on ventral fore femora and apical fore tibia relatively small and weak, 3) submedian tubercles on abdominal terga moderate or rudimentary, and 4) caudal filaments with whorls of setae at end of each segment; with dorsal intersegmental setae (Fig. 13).

1. *Drunella aculea* (Allen), 1971 (Fig. 1-5)

Ephemerella basalis Na Imanishi, 1940:196

Ephemerella basalis Imanishi; Tshernova, 1952:271 (Allen, 1971)

Ephemerella (Drunella) aculea Allen, 1971:522; Yoon & Kim, 1981:36

Diagnosis. *Adult.* Male imago. Body large size (20~30 mm); light brown or brown. Dorsal part of thorax dark brown (Fig. 2). ~~Fore leg tarsal~~ ^{Genital} forceps round; bow-like; 3rd segment 3~4 times as long as wide (Fig. 3). Penis broad in base; with V-shape notch on ventral apex; apical margin angled (Fig. 3). *Larva.* Body large size (20~25 mm); brown or dark brown. Head with three long clypeal tubercles; median ocellar tubercle shorter than lateral clypeal tubercles (Fig. 1). Frontal clypeal edge with submedian tubercles (Fig. 1), Fore femora with stout ventral tubercles; fore tibia with long apical spine (Fig. 1). Submedian tubercles on abdominal terga

inconspicuous (Fig. 1). Caudal filaments with whorls of spines at end of each segment; with lateral intersegmental setae.

Material Examined. *Adults.* 1 male imago, Pogwangsa, Yangju, Kyonggi, 1 IV 1984, Y.J. Bae, by rearing; 1 male imago, Kwangnung, Namyangju, Kyonggi, 17 IV 1983, Y.J. Bae, by rearing; 4 female imagos, Kyebangsan, Hongchon, Kangwon, 5 VI 1983, Y.J. Bae; 11 female imagos, Sobaeksan, Yongpung, Kyongbuk, 17 V 1984, Y.J. Bae; 12 female imagos, Togyusan, Muju, Chonbuk, 21~22 V 1983, Y.J. Bae, by rearing. *Larvae.* Tobongsan, Tobonggu, Seoul, 6 V 1981; Wanbongsan, Pochon, Kyonggi, 1 V 1982; Hwaaksan, Kapyong, Kyonggi, 1 IV, 1981; Myongjisan, Kapyong, Kyonggi, 15 II 1982, 23 III 1982, 5 V 1982; Chojongchon, Kapyong, Kyonggi, 27 V 1973; Yumyongsan, Kapyong, Kyonggi, 8 V 1983, 14 V 1983; Pogwangsa, Yangju, Kyonggi, 4 IV 1981; Iryong, Yangju, Kyonggi, 25 III 1983; Songchu, Yangju, Kyonggi, 12 VI 1971; Soyosan, Yangju, Kyonggi, 22 X 1982; Kwangnung, Namyangju, Kyonggi, 17 II 1983, 21 II 1983, 17 IV 1983; Namhansansong, Kwangju, Kyonggi, 19 IV 1981; Yongmunsan, Yangpyong, Kyonggi, 28 V 1982, 18 XI 1984; Chiljangsa, Ansong, Kyonggi, 25 XI 1984, Chonmi-ri, Yanggu, Kangwon 6 X 1972; Chondo-ri, Injae, Kangwon, 10 X 1982; Tuttayon, Injae, Kangwon, 15 III 1968; Chinbu, Injae, Kangwon, 27 IX 1972; Paektamsa, Injae, Kangwon, 11 X 1982; Changsuda, Injae, Kangwon, 25 V 1966, 19 IV 1968; Hyon-ri, Injae, Kangwon, 19 V 1968, 29 IX 1972; Osaek, Yangyang, Kangwon, 2 X 1983; Sogyebangsa, Hongchon, Kangwon, 29 VII 1981; Kyebangsan, Hongchon, Kangwon, 21 VII 1981, 6 VI 1983; Kachilbong, Hongchon, Kangwon, 23 VI 1984; Odaesan, Pyongchang, Kangwon, 14 X 1982; Choyangang, Pyongchang, Kangwon, 31 III 1985; Kariwangsan, Pyongchang, Kangwon, 31 III 1985; Paekambong, Pyongchang, Kangwon, 31 III 1985; Taebaeksan, Taebaek, Kangwon, 13 VIII 1983; Kyecheonchon, Hoengsong, Kangwon, 1 IV 1985; Yongdusan, Chechon, Chungbuk, 26 I 1983, 26 VII 1983; Chilgapsan, Chongyang, Chungnam, 27 IX 1982, 3 X 1983; Kapsa, Kongju, Chungnam, 3 IV 1983; Sobaeksan, Yongpung, Kyongbuk, 7 VI 1981, 27 I 1983; Chuwangsan, Chongsong, Kyongbuk, 29 I 1983; Pohyonsa, Yongchon, Kyongbuk, 25 IX 1984; Pogyongsa, Yongil, Kyongbuk, 30 I 1983; Haeinsa, Hapchon, Kyongnam, 31 I 1983; Naewonsa, Yangsan, Kyongnam 1 VI 1982; Piagol, Hamyang, Kyongnam, 18~19 IX 1982; Togyusan, Muju, Chonbuk, 20~21 V 1983; Songgwangsa, Sungju, Chonbuk, 30 V 1983; Minjujisan, Muju, Chonbuk, 1 X 1984

Distribution. Korea, Siberia

2. *Drunella triacantha* (Tshernova) , 1949(Fig. 6-9)

Ephemerella trispina na Imanishi, 1940:193

Ephemerella trispina naa Imanishi, 1940:194

Ephemerella triacantha Tshernova, 1949:151; Tshernova, 1952:271; Bajkova, 1972:190

Ephemerella (Drunella) trispina Ueno; Yoon & Kim, 1981:37

Diagnosis. *Adult.* Male imago. Body medium size (15~20 mm); brown. Fore leg tarsal segment 2 and subequal (Fig. 8). Hindleg illustrated in Fig. 9. Genital forceps round; bow-like; 3rd segment 3~4 times as long as wide (Fig. 9). Penis narrow in base; V-shape notch in ventral apex; apical margin round (Fig. 7). *Larva.* Body medium size (10~15 mm); brown or dark brown. Frontal clypeal edge round (Fig. 6). Fore femora with stout ventral tubercles; fore tibia with long apical spine. Abdominal terga with ruimentary submedian tubercles. Caudal filaments

with whorls of setae at end of each segment; with lateral intersegmental setae.

Material Examined. *Adult.* 1 male imago, Chungsan-ri, Sanchong, Kyongnam, 30 VII 1981, J. Byun. *Larvae.* Chojongchon, Kapyong, Kyonggi, 29 IV 1973; Yumyongsan, Kapyong, Kyonggi, 14 V 1983; Myongjisan, Kapyong, Kyonggi, 5 V 1982; Chonmasan, Namyangju, Kyonggi, 29 V 1971; Tuttayon, Injae, Kangwon, 15 III 1968; Hyon-ri, Injae, Kangwon, 19 V 1968; Sogyebangsan, Hongchon, Kangwon, 22 VII 1981; Kyebangsan, Hongchon, Kangwon, 6 VI 1983; Kachilbong, Hongchon, Kangwon, 23 VI 1984; Wonsong, Chiaksan, Kangwon, 10 IV 1983; Odaesan, Pyongchang, Kangwon, 2 VI 1965; Imgye, Chongson, Kangwon, 8 V 1984; Kyechonchon, Hoengsong, Kangwon, 1 IV 1985; Sobaeksan, Yongpung, Kyongbuk, 7 VI 1981; Naewonsa, Yangsan, Kyongnam, 27 V 1982, 1 VI 1982; Piagol, Hamyang, Kyongnam, 22 VI 1982, 22 VII 1982; Togyusan, Muju, Chonbuk, 20~21 V 1983

Distribution. Korea, Siberia

3. *Drunella cryptomeria* (Imanishi), 1937 (Fig. 10-11)

Ephemerella cryptomeria Imanishi, 1937:328

Ephemerella nG Imanishi, 1940:195

Ephemerella yoshinoensis Gose, 1963:142

Ephemerella (Drunella) yoshinoensis Gose ; Allen, 1971:525

Ephemerella (Drunella) cryptomeria Imanishi; Yoon & Kim, 1981:36

Diagnosis. *Adult.* Male imago. Genital forceps brown; 2nd segment swollen on the inner apical margin; without a constriction; 3rd segment paler in color; more than three times as long as wide. Penis lobes brown; separated apically; each lobe round at its apex. (Modified from Imanishi, 1937:239, Fig. 6). *Larva.* Head with three long clypeal tubercles; length subequal (Fig. 10). Frontal clypeal edge notched (Fig. 10). Fore femora with stout tubercles on ventral edge; with distinct ridges on dorsal surface (Fig. 11). Fore tibia with long apical spine (Fig. 11). Caudal filaments with whorls of setae at end of each segment; with lateral intersegmental setae (Fig. 13).

Material Examined. *Larvae.* Paegunsan, Pochon, Kyonggi, 9 VIII 1984; Wangbangsan, Pochon, Kyonggi, 8 IX 1984; Hwaaksan, Kapyong, Kyonggi, 20 VII 1982, 1 X 1982; Myongjisan, Kapyong, Kyonggi, 23 IV 1982, 3 VII 1982, 30 VIII 1982, 2, IX 1982, 4 IX 1982; Chojongchon, Kapyong, Kyonggi, 29 IV 1973, 27 V 1973, 22 VI 1974, 13 VIII 1978, 24 IX 1978; Yumyongsan, Kapyong, Kyonggi, 14 V 1983; Pogwangsa, Yangju, Kyonggi, 12 VIII 1981; Chonmasan, Namyangju, Kyonggi, 14 VIII 1977; Chonmi-ri, Yanggu, Kangwon, 19 VI 1983; Omi-ri, Yanggu, Kangwon, 19 VI 1983; Tuttayon, Injae, Kangwon, 12 VI 1983; Paektamsa, Injae, Kangwon, 26 VII 1982; Pangdaesan, Injae, Kangwon, 30 VII 1982; Sogyebangsan, Hongchon, Kangwon, 22 VII 1981; Kyebangsan, Hongchon, Kangwon, 6 VI 1983; Kachilbong, Hongchon, Kangwon, 24 VII 1981, 23 VI 1984; Chiaksan, Wonsong, Kangwon, 29~31 VIII 1975, 2~3 IX 1982, 15 VIII 1984; Sogumgangsan, Myongju, Kangwon, 17 IX 1971, 19 IX 1975; Odaesan, Pyongchang, Kangwon, 20 VII 1981; Songnisan, Poun, Chungbuk, 10 VIII 1983; Hwayang-ri, Koesan, Chungbuk, 2 V 1982, 15 IX 1984; Kwanpyong-ri, Koesan, Chungbuk, 16 IX 1984; Munkyoungsaejae, Munkyoung, Kyongbuk, 11~12 VIII 1983; Naewonsa, Yangsan, Kyongnam, 27 V 1982; Piagol, Hamyang, Kyongnam, 22~23 VI 1982, 22 VII 1982; Chungsan-ri, Sanchong, Kyongnam, 30 VII 1981; Kuchondong, Mjju, Chonbuk,

16~21 VIII 1970; Togyusan, Muju, Chonbuk, 20 V 1983; Paegyangs^a Changsong, Chonnam, 29 V 1983; Hwaomsa, Kurye, Chonnam, 30 V 1983; Songgwangsa, Sungju, Chonnam, 9 VIII 1976; 30 V 1983; Sonamsa, Sungju, Chonnam, 10 VIII 1967; Tongchon, Kwangyang, Chonnam, 29 V 1981, 18 VI 1983; Ponggangchon, Kwangyang, Chonnam, 11 VI 1983

Distribution. Korea, Japan

4. *Drunella longipes* (Tshernova), 1952 (Fig. 12-13)

Ephemerella nM Imanishi, 1940:198

Ephemerella longipes Tshernova, 1952:274

Ephemerella (Drunella) bicornis Gose; Yoon & Kim, 1981:36

Diagnosis. *Adult.* Unknown. *Larva.* Head without clypeal tubercles; with paired occipital tubercles (Fig. 12). Tubercles on ventral edge of fore femora relatively small and weak. Submedian tubercles on abdominal terga rudimentary. Caudal filaments with whorls of setae at end of each segment; with dorsal intersegmental setae (Fig. 13).

Material Examined. *Larvae.* Paegunsan, Pochon, Kyonggi, 29 V 1981; Konbongsa, Kosong, Kangwon, 14 V 1968; Tuttayon, Injae, Kangwon, 19 VI 1983; Kyebangsan, Hongchon, Kangwon, 21 VII 1981, 6 VI 1983; 19 VI 1983; ~~Kyebangsan, Hongchon, Kangwon, 21 VII 1981, 6 VI 1983;~~ Odaesan, Pyongchang, Kangwon, 2 VI 1965; Taebaeksan, Taebaek, Kangwon, 13 VIII 1983; Sobaeksan, Yongpung, Kyongbuk, 7 VI 1981; Piagol, Hamyang, Kyongnam.

Distribution. Korea, Siberia

Genus *Cincticostella* Allen, 1971

nigra-group Imanishi, 1938:33

Cincticostella Allen, 1971:513; Allen, 1980:82

Asiatella Tshernova, 1972:611 (by Allen, 1971)

Type species: *Cincticostella nigra* (Ueno)

Type locality: Japan

Diagnosis. *Adult.* Genital forceps bow-like; with broad groove in inside part (Fig. 16). Penis without spines or lateral lobes; ventral side open (Fig. 16). *Larva.* Head without distinct tubercles. Anteriolateral corner^r of pronotum and anterior portion of mesonotum with distinct expansion (Fig. 1⁹). Submedian tubercles on abdominal terga well developed. Caudal filaments with whorls of setae at end of each segment.

Distribution. Far Eastern Asia, Southwestern Asia.

Remarks. Allen (1971) established this genus based on the larval characteristics. Two tentative groupings could be proposed based on the Korean *Cincticostella* larvae. In particular, there are close relationships among *C. castanea*^e group larvae.

C. castanea group: *C. castanea* (Allen, 1971; *C. nigra* (Ueno), 1928; *E. nay* (Imanishi, 1940) (= *C. orientalis* (Tshernova), 1952), *E. EC* (Gose, 1962) (= *C. okumai* (Gose), 1980), *C. ezoensis* (Gose), 1980 -- 1) body not stumpy, 2) anteriolateral corner of pronotum and anterior portion of mesonotum distinctly expanded, 3) submedian tubercles on abdominal terga moderate or rudimentary, and 4) caudal filament^e with whorls of setae; sometimes with intersegmental setae.

C. tshernovae group: *E. nax* (Imanishi, 1940) (= *C. tshernovae* (Bajkova), 1962) -- 1) body relatively stumpy (Fig. 1⁹), 2) anteriolateral corner of pronotum and anterior portion of

mesonotum expanded (Fig. 4), 3) submedian tubercles on abdominal terga relatively acute, 4) caudal filaments with whorls of setae.

5. *Cincticostella castanea* (Allen), 1971 (Fig. 14-18)

Ephemerella (*Cincticostella*) *castanea* Allen, 1971:514; Allen, 1975:19; Yoon & Kim, 1981:

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Diagnosis. *Adult.* Male imago. Body medium size (15~20 mm); light brown. Dark paired stripes along submedian tubercles on abdominal terga (Fig. 15). Fore tarsal segment 2 and 3 subequal (Fig. 17). Hindleg illustrated in Fig. 18. Genital forceps bowed; with broad groove along inside edge; 1st segment concealed, nearly invisible; 3rd segment small (Fig. 16). Penis simple; ventral side open; with dark marginal stripes in ventral side (Fig. 16). *Larva.* Body medium size (10~15 mm); brown or dark brown. Head without distinct tubercles. Abdominal terga with moderate submedian tubercles; with dark stripes along submedian ^{tubercles} stripes (Fig. 14). Caudal filaments with whorls of setae at end of each segment.

Material Examined. *Adults.* 1 male imago, 1 female imago, 1 male subimago, 1 female subimago, Tobongsan, Tobonggu, Seoul, 15 V 1983, Y.J. Bae, by rearing; 7 male imagos, 8 female imagos, Pogwangsa, Yangju, Kyonggi, 25 III 1984, Y.J. Bae, by rearing; 12 male imagos, 3 female imagos, 1 female subimago, Kwangnung, Namyangju, Kyonggi, 17 IV 1983, Y.J. Bae, by rearing; 1 female imago, Hwaaksan, Kapyong, Kyonggi, 11 V 1982, J.U. Byun; 1 male imago, Togyusan, Muju, Chonbuk, 11 V 1983, Y.J. Bae, by rearing. *Larvae.* Tobongsan, Tobonggu, Seoul, 6 V 1981, 11 III 1982, 15 V 1983; Wangbangsan, Pochon, Kyonggi, 1 IV 1982; Soyosan, Pochon, Kyonggi, 22 X 1982; Myongjiisan, Kapyong, Kyonggi, 15 II 1982, 23~24 III 1982, 29 III 1982, 27 IV 1982; Chonggyesan, Kapyong, Kyonggi, 24 V 1981; Chongchongchon, Kapyong, Kyonggi, 29 IV 1972; Yumyongsan, Kapyong, Kyonggi, 8 V 1983, 14 V 1983; Pogwangsa, Yangju, Kyonggi, 4 IV 1981; Iryong, Yangju, Kyonggi, 25 III 1981; Kwangnung, Namyangju, Kyonggi, 18 IV 1965, 16 I 1983, 17 II 1983, 21 II 1983, 20 III ~~21 III~~ 1983, 17 IV

1983; Suraksan, Namyangju, Kyonggi, 21 XI 1982; Namhansansong, Kwangju, Kyonggi, 2 IV 1972, 19 IV 1981; Yongmunsan, Yangpyong, Kyonggi, 28 V 1982, 16 XI 1984; Wangbangsan, Pochon, Kyonggi, 1 V 1982; Chiljangsa, Ansong, Kyonggi, 25 X 1984; Chonmi-ri, Yanggu, Kangwon, 6 X 1972; Suibchon, Yanggu, Kangwon, 15 III 1968; Paektamsa, Injae, Kangwon, 11 X 1982; Sorakdong, Sokcho, Kangwon, 15 I 1983, 21 I 1984; Osaek, Yangyang, Kangwon, 2 X 1983; Yangyangchon, Yangyang, Kangwon, 13 X 1982; Kyebangsan, Hongchon, Kangwon 6 VI 1983; Chiaksan, Wonsong, Kangwon, 10 IV 1983; Choyanggang, Pyongchang, Kangwon 31 III 1985; Kariwangsan, Pyongchang, Kangwon, 31 III 1985; Paekambong, Pyongchang, Kangwon, 31 III 1985; Kyecheonchon, Hoengsong, Kangwon, 1 IV 1985; Yongdusan, Chechon, Chungbuk, 26 I 1983; Musimchon, Chongju, Chungbuk, 2 V 1982; Chilgapsan, Chongyang, Chungnam, 3 X 1983; Magoksa, Kongju, Chungnam, 26 IX 1982; Kapsa, Kongju, Chungnam, 3 IV 1983; Tonghaksa, Kongju, Chungnam, 3 IV 1983; Sudojksa, Yeon, Chungnam, 2 X 1983; Sobaeksan, Yongpung, Kyongbuk, 27 I 1983, 19 V 1984; Naesong, Ponghwa, Kyongbuk, 28 I 1983; Chuwangsan, Chongsong, Kyongbuk, 29 I 1983; Pogyongsa, Iryong, Kyongbuk, 30 I 1983; Tonghwasa, Taegu, Kyongbuk, 30 I 1983; Haeinsa, Hapchon, Kyongnam, 31 I 1983; Pomosa, Pusan, Kyongnam, 4 X 1982; Paegyongsan, Pusan, Kyongnam, 5 I 1983; Togyusan, Muju, Chonbuk,

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20~21 V 1983; Minjujisan, Juju, Chonbuk, 1 X 1985; Moaksan, Kimje, Chonbuk, 30 IX 1984; Puguisan, Chinan, Chonbuk, 1 X 1984; Mudungsan, Kwangju, Chonnam, 13 IV 1982; Tolsan, Yochon, Chonnam, 11 IV 1982

Distributon. Korea

6. *Cincticostella tshernovae* (Bajkova), 1962 (Fig. 19-22)

Ephemerella nax Imanishi, 1940:205; Tshernova, 1952:274

Ephemerella tshernovae Bajkova, 1962:203

Ephemerella imanishi Allen, 1971:517

Diagnosis. *Adult.* Female imago. Body medium size (10~15 mm); black (Fig. 20). Legs light in color; illustrated in Figs. 21 and 22. *Larva.* Body medium size (10~15 mm); black or dark brown; relatively stumpy and stout (Fig. 19). Abdominal terga 5~9 with acute submedian tubercles (Fig. 19). Caudal filament with whorls of setae at end of each segment.

Material Examined. *Adults.* 2 female imagos, Togyusan, Muju, Chonbuk, 22 V 1983, Y.J. Bae, by rearing. *Larvae.* Hwaaksan, Kapyong, Kyonggi, 1 IV 1982; Chojongchon, Kapyong, Kyonggi, 29 IV 1973, 24 IX 1978; Kwangnung, Namyangju, Kyonggi, 17 II 1983; Chonmi-ri, Injae, Kangwon, 10 X 1982; Tuttayon, Injae, Kangwon, 15 III 1968, 7 X 1972; Paektamsa, Injae, Kangwon, 11 X 1982; Chinbu, Injae, Kangwon, 27 IX 1972; Hyon-ri, Injae, Kangwon, 19 V 1968; Changsuda, Injae, Kangwon, 19 IX 1968; Chiaksan, Wonsong, Kangwon, 10 IV 1983; Yangyangchon, Yangyang, Kangwon, 13 X 1982; Odaesan, Pyongchang, Kangwon, 14 X 1982; Kariwangsan, Pyongchang, Kangwon, 31 III 1985; Paegambong, Pyongchang, Kangwon, 31 III 1985; Kyecheonchon, Hoengsong, Kangwon, 1 IV 1985; Sodaesan, Okchon, Chungbuk, 4 X 1972; Taedunsan, Kumsan, Chungnam, 24 IX 1982; Pogyongsa, Yongil, Kyongbuk, 30 I 1983; Chuwangsan, Changsong, Kyongbuk, 29 I 1983; Pyochungsa, Yangsan, Kyongnam, 1 II 1983; Hwaomsa, Kurye, Chonnam, 30 V 1983

Distribution. Korea, Manchuria, Siberia, Japan

Genus *Acerella* Allen, 1971

Acerella Allen 1971:518

Type species: *A. longicaudata* (Ueno)

Type locality: Japan

Diagnosis. *Adult.* Male imago. Genital forceps bowed; with broad groove along inside edge; 3rd segment small (Fig. 23). Penis simple; broad in base; with V-shape notch in ventral side (Fig. 23). *Larva.* Mesonotum with lateral projections (Fig. 26). Caudal filaments with whorls of setae at end of each segment.

Distribution. Korea, Japan, Southeastern Asia

7. *Acerella longicaudata* (Ueno), 1928 (Fig. 23-26)

Ephemerella longicaudata Ueno, 1928:42; Imanishi, 1973:323; Allen, 1971:518

Ephemerella (Serratella) longicaudata Ueno; Edmunds, 1959:545

Ephemerella (Acerella) longicaudata Ueno; Gose, 1980:366

Diagnosis. *Adult.* Male imago. Body medium size (13~18 mm); dark brown. Fore talsal segments 2 and 3 subequal (Fig. 24). Hindleg illustrated in Fig. 25. Genital forceps bowed; with broad groove along inside edge; 3rd segment small (Fig. 23). Penis simple; with V-shape notch in ventral side (Fig. 23). *Larva.* Body medium size (10~15 mm); dark brown. Pronotum and mesonotum not expended laterally; mesonotum with large lateral projections (Fig. 26). Submedian tubercles on abdominal segment 2~9 moderate (Fig. 26). Caudal filaments longer than body; with whorls of setae at end of each segment.

Material Examined. *Adults.* 2 male imagos, 2 female imagos, 1 female subimago, Kwangnung, Namyangju, Kyonggi, IV 1983, Y.J. Bae, by rearing. *Larvae.* Kwangnung, Namyangju, Kyonggi, 16 I 1983, 17 II 1983, 21 II 1983, 20 III 1983, 17 IV 1983

Distribution. Korea, Japan

Genus *Serratella* Edmunds, 1959

Serratella Edmunds, 1959:544; Allen & Edmunds, 1963:583; Allen, 1980:75

Type species: *Serratella serrata* Morgan

Type locality: North America

Diagnosis. Male imago. Penis expended laterally (Fig. 30). *Larva.* Body small (5~10 mm). Pronotum and mesonotum without lateral expansion. Abdominal terga without submedian tubercles. Caudal filaments with whorls of setae at end of each segment (Fig. 28).

Remarks. The larvae of the *Serratella* are distinguished from that of the *Ephemerella* by the absence of intersegmental setae in caudal filaments. Two tentative groupings could be proposed based on Korean *Serratella* larvae.

Serratella setigera group: *E.* EB (Gose, 1962) (= *Serratella setigera* (Bajkova), 1962) -- 1) caudal filaments relatively long; without intersegmental setae. 2) mandible normal, and 3) abdominal terga with spinuled submedian tubercles.

Serratella rufa group: *Serratella rufa* (Imanishi, 1973); *E.* EE (Gose, 1962) (= *S. chinoi* (Gose), 1980) -- 1) caudal filaments relatively short; without intersegmental setae, 2) mandible large; protrude forward, and 3) abdominal terga without submedian tubercles.

8. *Serratella setigera* (Bajkova), 1967 (Fig. 27-28)

Ephemerella EB Gose, 1962:17

Ephemerella setigera Bajkova, 1967:333

Ephemerella (*Serratella*) *setigera* Bajkova; Yoon & Kim, 1981:39

Diagnosis. *Adult.* Unknown. *Larva.* Body small size (8~10 mm); brown with dark markings; minute granules scattered. Head and thorax without distinct tubercles. Submedian tubercles on abdominal terga 3~9 moderate; with spinules (Fig. 27). Caudal filaments with whorls of setae at end of each segment; without intersegmental setae; with dark bands on alternate pairs of segments (Fig. 28)

Material Examined. *Larvae.* Paegunsan, Pochon, Kyonggi, 9 VIII 1984; Wangbangsan, Pochon, Kyonggi, 18 IX 1984; Hwaaksan, Kapyong, Kyonggi, 20 VII 1982; Chojongchon, Kapyong, Kyonggi, 27 V 1973, 27 VI 1974, 13 VIII 1978, 24 IX 1978; Chongpyong, Kapyong, Kyonggi, 22 VIII 1971, 12 VI 1983; Hwaaksan, Kapyong, Kyonggi, 29 IX 1971; Taesong-ri, Kapyong, Kyonggi, 27 IX

1981; Myongjisan, Kapyong, Kyonggi, 10 VII 1982; Pogwangsa, Yangju, Kyonggi, 12 VIII 1981; Kwangnung, Namyangju, Kyonggi, 16 X 1983; Chonmiri, Yanggu, Kangwon, 19 VI 1983; Chiaksan, Wonsong, Kangwon, 2 IX 1982; Pangdaesan, Injae Kangwon, 30 VII 1981; Yangyangchon, Yangyang, Kangwon, 13 X 1982; Sogyebangsan, Hongchon, Kangwon, 22 VII 1981; Kangchon, Chunsong, Kangwon, 15 X 1972; Chiaksan, Wonsong, Kangwon, 30 VII 1975, 17 VIII 1984; Sogumgangsan, Myongju, Kangwon, 17 IX 1971; Songnisan, Poun, Chungbuk, 11 VIII 1983; Sodaesan, Okchon, Chungbuk, 25 IX 1982; Hwayang-ri, Kofesan, Chungbuk, 15 IX 1984; Kwanyong-ri, Koesan, Chungbuk, 16 IX 1984; Magoksa, Kongju, Chungnam, 26 IX 1982; Tonghaksa, Kongju, Chungnam, 18 VI 1982; Chilgapsan, Chongyang, Chungnam, 27 XI 1982; Mungyongsaejae, Mungyong, Kyongbuk, 12 VIII 1983; Naewonsa, Yangsan, Kyongnam, 27 V 1982, 1 VI 1982; Piagol, Hamyang, Kyongnam, 22 VII 1982; Hoeyachon, Yangsan, Kyongnam, 23 IX 1984; Kuchon-ri, Kojae, Kyongnam, 4 VII 1983; Moaksan, Kimje, Chonbuk, 30 IX 1984; Paegyangsa, Changsong, Chonnam, 29 V 1983; Hwaomsa, Kurye, Chonnam, 5 V 1967; Songgwangsa, Sungju, Chonnam, 9 VII 1967; Tongchon, Kwangyang, Chonnam, 29 V 1981, 18 V 1983; Kangjongchon, Namjaeju, Cheju, 11 IV 1982

Distribution. Korea, Japan, Siberia

9. *Serratella rufa* (Imanishi), 1937 (Fig. 29-32)

Ephemerella rufa Imanishi, 1937:327; Imanishi, 1940:208; Tshernova, 1952:275; Bajkova, 1972:197

Ephemerella (Serratella) rufa Imanishi; Yoon & Kim, 1981:39

Diagnosis. *Adult.* Male imago. Body small size (7~10 mm); reddish brown. Fore tarsal segments 2 and 3 subequal (Fig. 31). Hind leg illustrated in Fig. 32. Genital forceps slightly bowed; 1st segment invisible; 3rd segment small (Fig. 30). Penis expended laterally (Fig. 30). *Larva.* Body small size (7~8 mm); brown or dark brown with light paired longitudinal stripes along dorsal body (Fig. 29). Mandible large; protrude forward. Abdominal terga without tubercles (Fig. 29). Caudal filaments relatively short; with whorls of stout setae at end of each segment (Fig. 29).

Material Examined. *Adults.* 1 male imago, Cheryong-ri, Kapyong, Kyonggi, 15 VIII 1982, J.U. Byun; 1 male imago, 3 female imagos, 2 female subimagos, Wangsukchon, Namyangju, Kyonggi, 3 V 1984, Y.J. Bae, by rearing; 1 male imago, 3 male subimagos, 3 female subimagos, Hwaomsa, Kurye, Chonnam, 30 V 1983, Y.J. Bae. *Larvae.* Paegunsan, Pochon, Kyonggi, 9 VIII 1984; Hwaaksan, Kapyong, Kyonggi, 20 VII 1982; Myongjisan, Kapyong, Kyonggi, 10 VII 1982, 23 I 1983; Chojongchon, Kapyong, Kyonggi, 20 IV 1973, 27 V 1973, 22 VI 1973, 31 VII 1973, 13 VII 1978, 24 VII 1978, 24 IX 1978, 24 X 1978; Pogwangsa, Yangju, Kyonggi, 4 IV 1981; Kwangung, Namyangju, Kyonggi, 2 IV 1972, 17 II 1983, 18 III 1983, 20 III 1983, 31 III 1983, 17 IV 1983; Paldang, Namyangju, Kyonggi, 4 X 1972; Kyonganchoon, Kwangju, Kyonggi, 26 IV 1981; Yoju, Yoju, Kyonggi, 14 X 1972; Chonmi-ri, Yanggu, Kangwon, 19 VI 1983; Chondo-ri, Injae, Kangwon, 10 X 1982; Tuttayon, Injae, Kangwon, 19 VI 1983; Paektamsa, Injae, Kangwon, 4 VI 1979, 4 X 1982; Yangyangchon, Yangyang, Kangwon, 13 X 1982; Chunchon, Chunchon, Kangwon, 26 III 1972; Kangchon, Chunsong, Kangwon, 18 VI 1972, 15 X 1972; Chiaksan, Wonsong, Kangwon, 17 VIII 1984; Odaesan, Pyongchang, Kangwon, 20 VII 1981; Imgye, Chongson, Kangwon, 8 V 1984;

Yongdusan, Chechon, Chungbuk, 10 VII 1983; Songnisan, Poun, Chungbuk, 11 VIII 1983; Hwayang-ri, Koesan, Chungbuk, 2 V 1982, 15 IX 1984; Kwanpyong-ri, Koesan, Chungbuk, 16 IX 1984; Sodaesan, Okchon, Chungbuk, 17 IV 1972, 25 IX 1982; Magoksa, Kongju, Chungnam, 26 IX 1982; Naesong, Ponghwa, Kyongbuk, 28 I 1983; Mungyongsaejae, Mungyong, Kyongbuk, 28 VIII 1983; Pisulsan, Talsong, Kyongbuk, 24 IX 1984; Naewonsa, Yangsan, Kyongnam, 27 V 1982, 1 VI 1982; Hoeyachon, Yangsan, Kyongnam, 23 IX 1984; Kuchon-ri, Kojae, Kyongnam, 4 VII 1983; Togyusan, Muju, Chonbuk, 20 V 1983; Moaksan, Kŭmje, Chonbuk, 30 IX 1984; Puguisan, Chinan, Chonbuk, 1 X 1984; Paegyangsa, Changsong, Chonnam, 29 V 1983; Hwaomsa, Kurye, Chonnam, 30~31 IV 1983; Songgwangsa, Sungju, Chonnam, 9 VIII 1976, 30 V 1983; Tongchon, Kwangyang, Chonnam, 18 VI 1983; Ponggangchon, Kwangyang, Chonnam, 11 VI 1983

Distribution. Korea, Japan, Siberia

Genus *Ephemerella* Walsh, 1862

Ephemerella Walsh, 1862:377; Edmunds, 1959:544; Allen, 1980:74

Type species: *Ephemerella excrucians* Walsh

Type locality: North America

Diagnosis. *Adult.* Penis of male variable; with or without spines; with a swallow notch in most. (Modified from Edmunds, 1959; Allen, 1980). *Larva.* Body small size (5~10 mm). Pronotum and mesonotum without lateral expansion (Figs. 33, 39). Abdominal terga with submedian tubercles (Figs. 33, 35, 39). Caudal filaments with whorls of setae at end of each segments; with lateral intersegmental setae (Fig. 34).

Remarks. The *Ephemerella* shows wide range of character overlap among the species in both adult and larval stage. Generally, the larvae of the *Ephemerella* are characterized by 1) absence of thoracic expansion in pronotum and mesonotum, 2) intersegmental setae on caudal filaments, 3) presence or absence of thoracic humps, and 4) submedian tubercles on abdominal terga. Three tentative groupings could be proposed based on Korean *Ephemerella* larvae.

Ephemerella imanishii group: *E. nF* (Imanishi, 1940) (= *E. imanishii* Gose, 1980); *E. EA* (Gose, 1968) (= *E. cornutus* Gose, 1980); *E. ishiwatai* Gose, 1980 -- 1) thorax with distinct humps (Fig. 33), 2) abdominal terga with granuled submedian tubercles, and 3) caudal filaments with intersegmental setae.

Ephemerella keijoensis group: *E. keijoensis* Allen, 1971; *E. nbx* (Imanishi, 1940) (= *E. denticula* Allen, 1971); *E. nb* (Imanishi, 1940) -- 1) thorax without distinct humps, 2) abdominal terga with granuled submedian tubercles, 3) caudal filaments with intersegmental setae.

Ephemerella notofascia group: *E. nba* (Imanishi, 1940) (= *E. notofascia* n. sp.); *E. nN* (Imanishi, 1940) (= *E. taeniata* Tshernova, 1952); *E. maxima* Allen, 1971 -- 1) thorax without distinct humps, 2) submedian tubercles on abdominal terga rudimentary; with spinules (Fig. 39) or absent, and 3) caudal filaments with intersegmental setae.

10. *Ephemerella imanishii* Gose, 1980 (Fig. 33-34)

Ephemerella nF Imanishi, 1940:202

Ephemerella (Ephemerella) imanishii Gose, 1980:366; Yoon & Kim, 1981:38

Diagnosis. *Adult.* Unknown. *Larva.* Body small size (8~10 mm); brown. Head, pronotum, and mesonotum with paired submedian humps; metanotum with median hump (Fig. 33).

Submedian tubercles on abdominal terga 1~9 granuled; relatively acute (Fig. 33). Caudal filaments with whorls of setae at end of each segment; with lateral intersegmental setae (Fig. 34).

Material Examined. *Larvae.* Pangdaesan, Injae, Kangwon, 30 VII 1981; Sogyebangsan, Hongchon, Kangwon, 22 VII 1981; Chiaksan, Wonsong, Kangwon, 29~31 VII 1975; 1 VIII 1975; Taebaeksan, Taebaek, Kangwon, 13 VIII 1983; Songnisan, Poun, Chungbuk, 10 VIII 1983; Chilgapsan, Chongyang, Chungnam, 3 X 1983; Mungyongsaejae, Mungyong, Kyongbuk, 12 VIII 1983; Hwagye, Hadong, Kyongnam, 7 VIII 1967; Pomosa, Pusan, Kyongnam, 1 VI 1982; Kuchondong, Muju, Chonbuk, 16~21 VIII 1970; Minjujisan, Muju, Chonbuk, 2 X 1984; Puguisan, Chinan, Chonbuk, 1 X 1984; Songgwangsa, Sungju, Chonnam, 9 VIII 1976; Ponggangchon, Kwangyang, Chonnam, 11 IV 1983

Distribution. Korea, Japan

11. *Ephemerella keijoensis* Allen, 1971, (Fig. 35-38)

Ephemerella (Ephemerella) keijoensis Allen, 1971:523

Diagnosis. *Adult.* Female imago. Body small size (8~10 mm); reddish brown or brown. Abdominal terga with paired lateral markings on each segment (Fig. 36). Fore leg illustrated in Fig. 37; hindleg in Fig. 38. *Larva.* Body small size (9~10 mm); brown. Head and thorax without distinct humps. Submedian tubercles on abdominal terga 2~9 moderate; granuled (Fig. 35). Caudal filaments with whorls of setae at end of each segment; with lateral intersegmental setae.

Material Examined. *Adults.* 4 female imagos, Kyebangsan, Hongchon, Kangwon, 5 VI 1983, Y.J. Bae; 30 female imagos, Sobaeksan, Yongpung, Kyongbuk, 17 V 1984, Y.J. Bae; 1 female imago, 1 female subimago, Togyusan, Muju, Chonbuk, 22 V 1983, Y.J. Bae, by rearing. *Larvae.* Paegunsan, Pochon, Kyonggi, 9 VIII 1984; Myongjisan, Kapyong, Kyonggi, 31 III 1982, 27 IV 1982; Chojongchon, Kapyong, Kyonggi, 29 IV 1973, 22 VI 1974, 24 IX 1978; Yumyongsan, Kapyong, Kyonggi, 8 V 1983, 14 V 1983; Pogwangsa, Yangju, Kyonggi, 4 IV 1981; Kwangnung, Namyangju, Kyonggi, 18 IV 1965, 17 II 1983, 31 II 1983, 20 III 1983, 17 IV 1984; Chiljangsa, Ansong, Kyonggi, 25 XI 1984; Tuttayon, Injae, Kangwon, 15 III 1968; Sorakdong, Sokcho, Kangwon, 21 I 1984; Kyebangsan, Hongchon, Kangwon, 6 VI 1983; Chiaksan, Wonsong, Kangwon, 10 IV 1983; Imgye, Chongson, Kangwon, 8 V 1984; Choyanggang, Pyongchang, Kangwon, 31 III 1985; Kariwangsan, Pyongchang, Kangwon, 31 III 1985; Kyecheonchon, Hengsong, Kangwon, 1 IV 1985; Yongdusan, Chechon, Chungbuk, 10 VII 1983; Sobaeksan, Yongpung, Kyongbuk, 27 I 1983; Naesong, Ponghwa, Kyongbuk, 28 I 1983; Tonghwasa, Taegu, Kyongbuk, 30 I 1983; Chuwangsan, Chongsong, Kyongbuk, 29 I 1983; Haeinsa, Hapchon, Kyongnam, 31 I 1983; Kuchondong, Muju, Chonbuk, 16 VIII 1970; Togyusan, Muju, Chonbuk, 20 V 1983; Tolsan, Yochon, Chonnam, 11 IV 1982

Distribution. Korea

12. *Ephemerella notofascia* n. sp. (Fig. 39)

Ephemerella nba Imanishi, 1940:207

Description. *Adult.* Unknown. *Larva* Body small size (8 mm); brown or dark brown with

irregular light markings; with broad traverse bands across basal part of wing pads and on abdominal terga 5~6 (Fig. 39). Head and thorax without distinct humps. Legs normal. Submedian tubercles on abdominal terga 2~9 rudimentary; spinuled; with light spots (Fig. 39). Bilamellate gills on abdominal segments 3~7; gills on segment 7 concealed. Posterolateral projections on abdominal segments 4~9 well developed; with lateral comb-like spinules (Fig. 39). Three caudal filaments as long as body; with whorls of setae at end of each segment; with lateral intersegmental setae (Fig. 39).

Type material. *Holotype*. mature larva, Kyebangsan, Hongchon, Kangwon, 6 VI 1983, Y.J. Bae, in alcohol, Korean Entomological Institute, Korea Univ., Seoul, Korea.

Material examined. *Larvae*. Paegunsan, Pochon, Kyonggi, 9 VIII 1984; Wangbangsan, Pochon, Kyonggi, 1 V 1982; Chojongchon, Kapyong, Kyonggi, 24 IX 1978; Myongjiisan, Kapyong, Kyonggi, 5 V 1982; Kwangnung, Namyangju, Kyonggi, 17 IV 1983; Yaju, Yaju, Kyonggi, 17 VI 1972; Chondo-ri, Injae, Kangwon, 10 X 1982; Kyebangsan, Hongchon, Kangwon, 6 VI 1983; Kachilbong, Hongchon, Kangwon, 23 VI 1984; Odaesan, Pyongchang, Kangwon, 4 VI 1965; Hwayang-ri, Koesan, Chungbuk, 15 IX 1984; Chilgapsan, Chongyang, Chungnam, 27 IX 1982; Mungyongsaejae, Mungyong, Kyongbuk, 12 VIII 1983; Togyusan, Muju, Chonbuk, 20~21 V 1983; Hwaomsa, Kurye, Chonnam, 30 V 1983; Tongchon, Kwangyang, Chonnam, 18 VI 1983

Distribution. Korea

Etymology. Gr. *noton* (back) + L. *fascia* (band)

Remarks. This species was first recognized by Imanishi (1940) from Korea, but unnamed at that time. This species is distinctly separated from other *Ephemerella* larvae by 1) wide traverse bands on thorax and abdomen, 2) shape of submedian tubercles on abdominal terga.

Key to the larvae of Ephemerellidae in Korea

1. Fore femora with distinct tubercles on ventral (leading) edge; fore tibiae with large apical spine (Fig. 1, 11). Genus *Drunella* ... 2
 Fore femora without ventral tubercles; fore tibiae without apical spine (Fig. 19, 25, 29, 39).
 5
2. Head with three long clypeal tubercles (Figs. 1, 6, 10). Ventral tubercles on fore femora relatively large and stout (Figs. 1, 11). Caudal filaments with lateral intersegmental setae (Fig. 1). 3
 Head without clypeal tubercles (Fig. 12). Ventral tubercles on fore femora relatively small and weak. Caudal filaments with dorsal setae (Fig. 13). *D. longipes*
3. Clypeal tubercles subequal (Fig. 6, 10). Clypeal edge round or notched (Fig. 6, 10). 4
 Median clypeal tubercles shorter than submedian clypeal tubercles; clypeal edge with paired acute humps (Fig. 1). *D. aculea*
4. Clypeal edge ^{round} notched (Fig. 6). Fore femora without dorsal ridge. *D. triacantha*
 Clypeal edge notched (Fig. 10). Fore femora with dorsal ridge (Fig. 11). *D. cryptomeria*
5. Anteriolateral corner of pronotum and anterior portion of mesonotum with distinct expansion (Fig. 19). Genus *Cincticostella* ... 6
 Pronotum and mesonotum without distinct expansion (Fig. 26, 29, 33, 39). 7
6. Abdominal terga 2~9 with moderate submedian tubercles (Fig. 14). *C. castanea*

- Abdominal terga 5~9 with acute submedian tubercles (Fig. 19).*C. tshernovae*
7. Mesonotum with large lateral projections (Fig. 26).Genus *Acerella*...*A. longicaudata*
 Mesonotum without large lateral projections (Fig. 29, 33, 39).8
8. Caudal filaments with whorls of setae at end of each segment; without lateral intersegmental setae (Fig. 28, 29).Genus *Serratella*...9
 Caudal filaments with whorls of setae at end of each segment; with lateral intersegmental setae (Fig. 34, 39).Genus *Ephemerella*...10
9. Dorsal body with distinct paired longitudinal stripes (Fig. 29). Abdominal terga without submedian tubercles (Fig. 29). Caudal filaments relatively short; without bands.*S. rufa*
 Body without stripes. Abdominal terga with paired submedian tubercles (Fig. 27). Caudal filaments relatively long; with dark bands on alternate pairs of segments (Fig. 27).*S. setigera*
10. Head, Pronotum, and mesonotum with paired submedian humps; metanotum with median hump (Fig. 33). Submedian tubercles on abdominal terga 1~9 relatively well developed (Fig. 33).*E. imanishii*
 Head and thorax without humps (Fig. 39). Submedian tubercles on abdominal terga moderate or rudimentary (Fig. 35, 39).11
11. Body with distinct light markings; with broad traverse band on mesonotum and on abdominal terga 5~6 (Fig. 39). Submedian tubercles on abdominal terga 2~9 rudimentary (Fig. 39).*E. notofascia* n. sp.
 Body without distinct markings; without traverse band on mesonotum. Submedian tubercles on abdominal terga 2~9 moderate (Fig. 35).*E. keijoensis*

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韓國產 알락하루살이科(하루살이目)의 分類

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1965~1985年 동안 南韓의 120여 地域에서 採集된 標本을 이용하여 韓國產 알락하루살이科의 12種을 再檢討하였다. 모든 幼蟲과 밝혀진 7種의 成蟲의 外部形質을 삽화와 함께 要約하였고, 幼蟲의 屬·種 檢索素를 作成하였다. 인근 種들과의 分類學的 關係를 論하였고, 類似種들을 임의로 grouping하고 Allen(1980)의 Ephemerellidae 分類體系로 다시 排列하였다. Imanishi(1940)가 韓國產으로 기록하였던 *Ephemerella nba*를 확인하고 새로이 命名하였다.

Family Ephemerellidae Klapalek, 1909 알락하루살이科

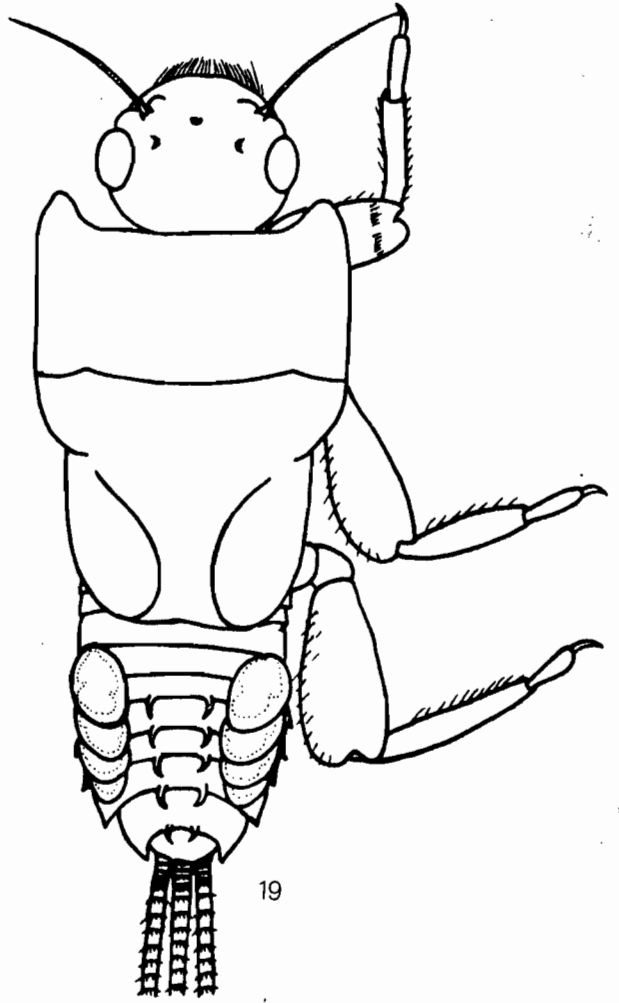
Subfamily Ephemerellinae Klapalek, 1909 알락하루살이亞科

Genus *Drunella* Needham, 1905 뿔알락하루살이屬

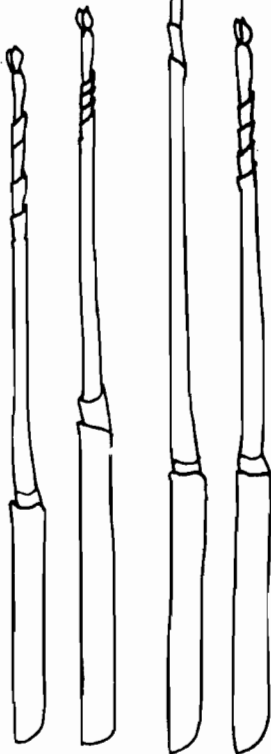
1. *Drunella aculea* (Allen), 1971 ~~뿔~~알락하루살이
2. *Drunella triacantha* (Tshernava), 1949 세뿔알락하루살이
3. *Drunella cryptomeria* (Imanishi), 1937 알통알락하루살이
4. *Drunella longipes* (Tshernova), 1952 쌍혹알락하루살이
Genus *Cincticostella*ⁿ Allen, 1971 민알락하루살이屬
5. *Cincticostella castanea* (Allen), 1971 민알락하루살이
6. *Cincticostella tshernovae* (Bajkova), 1962 검정알락하루살이
Genus *Acerella* Allen, 1971 긴꼬리알락하루살이屬
7. *Acerella longicaudata* (Ueno), 1928 긴꼬리알락하루살이
Genus *Serratella* Edmunds, 1959 빛살알락하루살이屬
8. *Serratella setigera* (Bajkova), 1967 빛살알락하루살이
9. *Serratella rufa* (Imanishi), 1937 세줄알락하루살이
Genus *Ephemerella* Walsh, 1862 알락하루살이屬
10. *Ephemerella imanishii* Gose, 1980 이마니시알락하루살이
11. *Ephemerella keijoensis* Allen, 1971 알락하루살이
12. *Ephemerella notofascia* n. sp. 등줄알락하루살이



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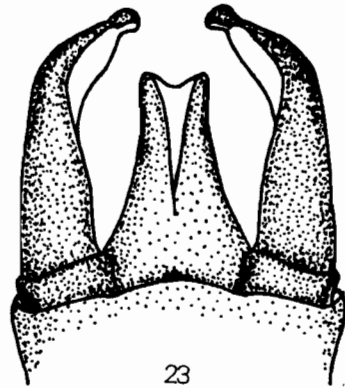


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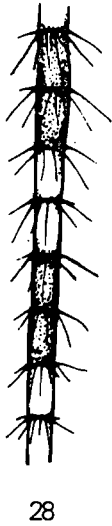
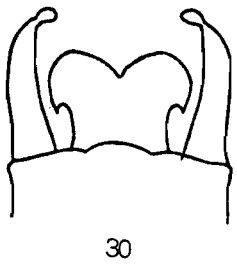
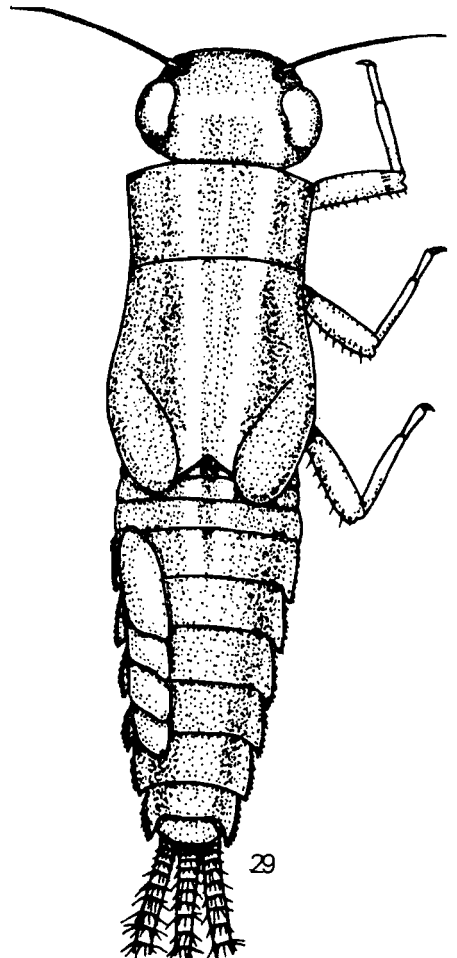
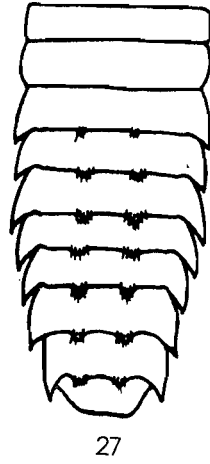
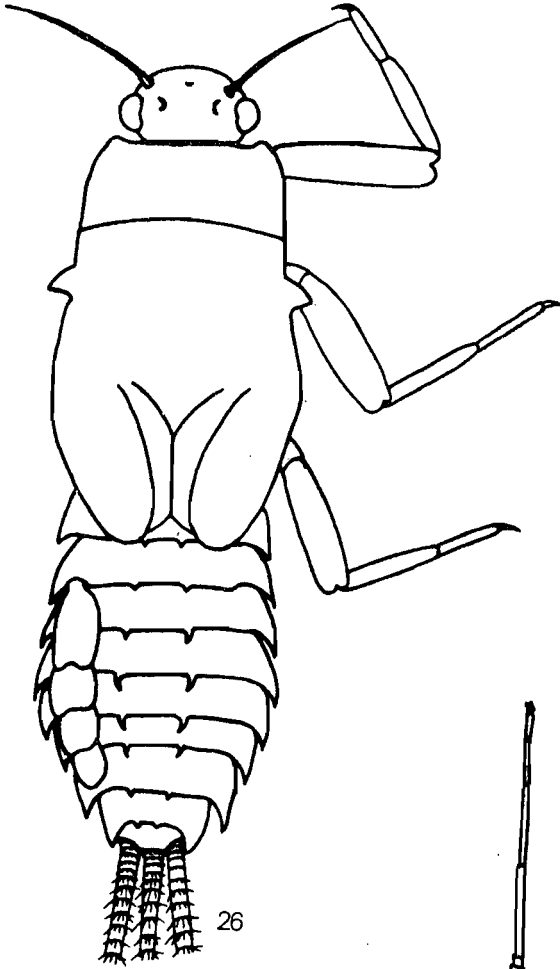
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FIGURES

1-5 : *Drunella aculea*

1. body dorsal view (larva) 2. body dorsal view (male imago) 3. genitalia (male imago) 4. fore leg (male imago) 5. hindleg (male imago)

6-9 : *Drunella triacantha*

6. head dorsal view (larva) 7. genitalia (male imago) 8. fore leg (male imago) 9. hindleg (male imago)

10-11 : *Drunella cryptomeria*

10. head dorsal view (larva) 11. fore leg (larva)

12-13 : *Drunella longipes*

12. head dorsal view (larva) 13. caudal filament lateral view (larva)

14-18 : *Cincticostella castanea*

14. abdomen dorsal view (larva) 15. abdomen dorsal view (male imago) 16. genitalia (male imago) 17. fore leg (male imago) 18. hindleg (male imago)

19-22 : *Cincticostella tshernovae*

19. body dorsal view (larva) 20. body dorsal view (female imago) 21. fore leg (female imago) 22. hindleg (female imago)

23-26 : *Acerella longicaudata*

27. abdomen dorsal view (larva) 28. caudal filament dorsal view (larva)

29-32 : *Serratella rufa*

29. body dorsal view (larva) 30. genitalia (male imago) 31. fore leg (male imago) 32. hindleg (male imago)

33-34 : *Ephemerella imanishii*

33. body dorsal view (larva) 34. caudal filament dorsal view (larva)

35-38 : *Ephemerella keijoensis*

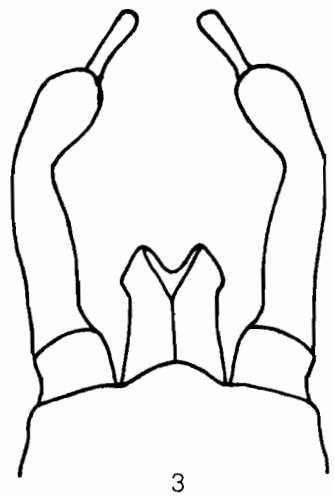
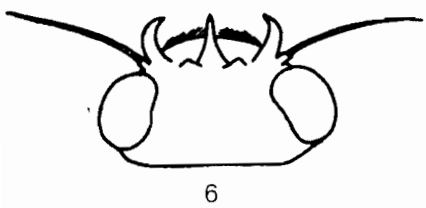
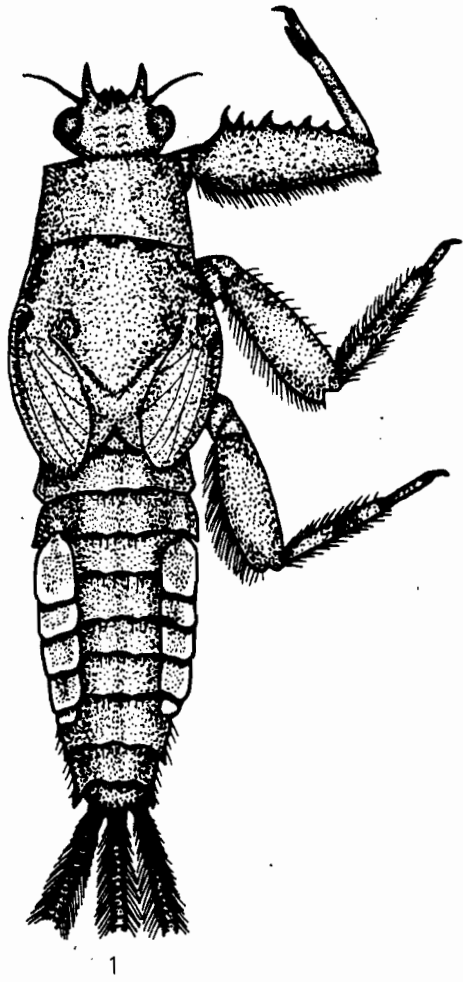
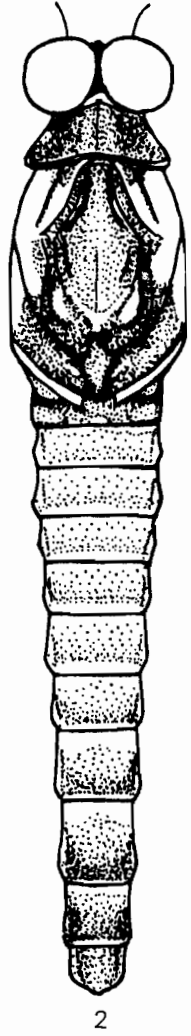
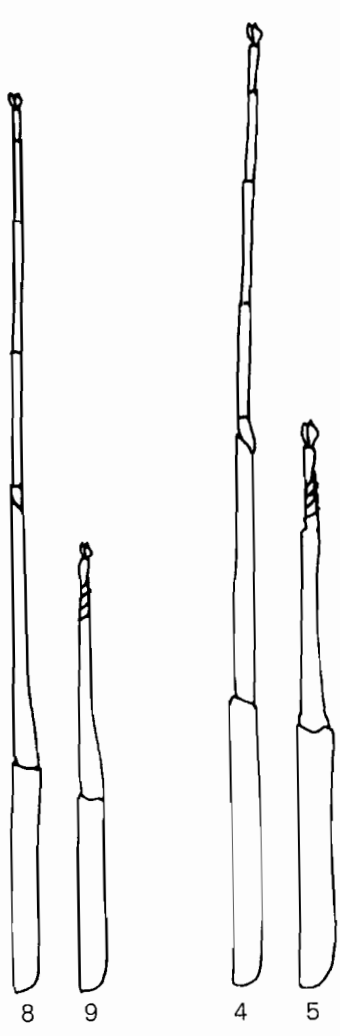
35. abdomen dorsal view (larva) 36. abdomen dorsal view (female imago) 37. fore leg (female imago) 38. hindleg (female imago)

39 : *Ephemerella notofascia* sp. n.

39. body dorsal view (larva)

23. genitalia (male imago) 24. fore leg (male imago) 25. hind leg (male imago)
26. body dorsal view (larva)

27-28 : *Serratella setigera*



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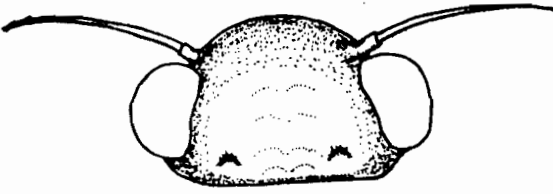
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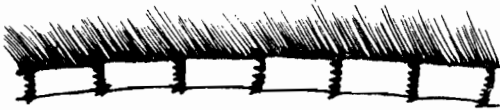
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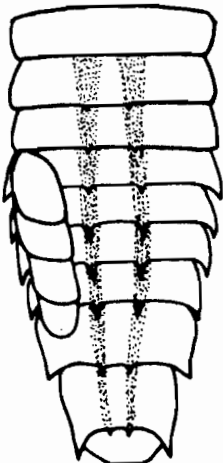
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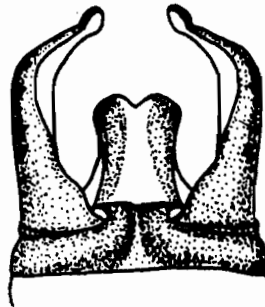
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