

## Observation of the Adults and Eggs of Two Species of the Family Perlidae (Plecoptera) to Korea

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강도래과(강도래목) 2種에 대한 成蟲 및 卵의 외부형태 관찰

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### 적 요

1989년과 1990년의 봄철에 전남, 특과 경남일원의 산간계류에서 채집된 강도래 과의 *Oyamia coreana* Okamoto와 *Kiotina decorata* (Zwick) 2종에 대한 성충의 외부 형태와 난의 전자현미경에 의한 미세구조 관찰을 실시하였다.

Key words: Perlidae, adult, egg, morphology, Korea.

### INTRODUCTION

The family Perlidae contains about 357 species belong to 48 genera in the world (Stark and Gaufin, 1976; Baumann, 1982). Observation and description on the external morphology of that of adult stage and eggs on family Perlidae have been accomplished actively by Isobe (1988), Stark (1986, 1989, 1990), Stark and Szczytko (1979, 1981) and Zwick (1984a, b). Stark and Szczytko (1984) proposed a new classification mainly based on egg morphology of Perlidae. The importance of external characters of eggs for identification and phylogeny in Plecoptera was reported by Zwick (1937a, 1980), Stark and Stewart (1981) and Stark and Szczytko (1982, 1984).

In north Korea, adult of *Oyamia coreana* was described by Okamoto (1921), *Kiotina decorata* by Zwick (1973b) and *O. nigribasis* was recorded by Zwick (1973c). And also nymphs of 5 genera (*Oyamia*, *Paragnetina*, *Neoperla*, *Kamimuria*, *Kiotina*) was reported by Yoon and Aw (1986) and Ra (1987), but no studies on adult stage and egg of Plecoptera has been done in south Korea.

This paper dealt with two species of Korean Perlidae and described external characters of adults, and eggs by scanning electron microscope (SEM).

## MATERIALS AND METHODS

Specimens used in this study were collected from Chonnam, Chonbuk and Kyongnam province of Korea during spring from 1989 to 1990. Figures of male and female terminal segments were taken after 10% KOH treatment. Adults were collected with aerial net or forcep, and the specimens were maintained in Mating Box (25 × 25 × 30cm).

Eggs were fixed in 2M phosphate buffer with 2.5% glutaraldehyde (4°C) for one day, fixed in 1% Osmium tetroxide for about 2 hours, and dehydrated in an ethanol series, acetone and isoamylacetate. Then they were dried in room temperature, mounted with double stick tape, coated with gold for 2 minutes at 5mA using an ion coater, and observed in a SEM (JOLE, TSM T330A) (Stark and Stewart, 1981; Stark and Szczytko, 1982; Uchida and Isobe, 1988). Specimens used in this study are deposited in the Entomological Laboratory, Department of Biology, Chonnam National University, Kwangju, Korea.

## RESULTS

As results of the study, two species of two genera were identified, and fully redescribed with figures and photographs.

### 1. *Oyamia coreana* Okamoto, 1921   진강도래 (Fig. 1, Plate 1)

**Material examined:** **Kwangyang:** 5♂♂, 20♀♀, Mt. Paekun valley, Songpulsu, 5. VI 1990 (Y.G. Cho); 3♂♂, 15♀♀, Mt. Paekun valley, Tongkok, 25. V 1990 (Y.G. Cho); **Kwangju:** 4♂♂, 15♀♀, Mt. Mudung, Sanjang valley, 8. V 1990 (Y.G. Cho); 1♂, 5♀♀, Mt. Mudung, Chungsimsa valley, 5. V 1989 (Y.G. Cho); 2♂♂, 6♀♀, Mt. Mudung, Upper valley of secondary reservoir, 5. V 1989 (Y.G. Cho); **Tamyang:** 2♂♂, 7♀♀, Mt. Pongp'ung valley, 15. V 1989 (S.K. Baik); **Kurye:** 5♂♂, 17♀♀, Mt. Chiri, P'iagol, 16. V 1989 (Y.G. Cho); **Namwon:** 1♂, 6♀♀, Mt. Chiri, Paemsagol, 18. V 1987 (J.S. Kim); **Changsong:** 2♂♂, 10♀♀, Paekyangsa, 8. V 1989 (S.K. Baik).

**Description:** Body length: male 15-17 mm, female 24-31 mm; forewing; male 15-19 mm, female 24-27 mm. General colour cinnamon-yellow, head and thorax blackish brown, legs yellow with black dots, wings light brown, forewing with 12 costal crossveins and 5 branched radius veins (Fig. 1a).

**Male:** From 4th tergite depressed dorsoforwardly. 4th and 5th tergite with one pairs of fringed-like processes, Tip of paraprocts separated, bearing teeth (Fig. 1b).

**Female:** Subgenital plate of 7th sternite with slightly notch on median of hind margin. 6th and 10th sternite with dark brown marking (Fig. 1c).

**Egg:** Dark brown colour, ovoid with a collar and anchor. Length about 370µm, diameter about 280µm (plate 1A). Collar angled spherical shape, connected anchor of mushroom shape by pedicel (plate 1B).

Chorion with indistinctly hexagonal plastron. Micropyles located below median line of egg (plate 1C).

Remarks: This species has characteristic with terminal segment and egg morphology, by which it can

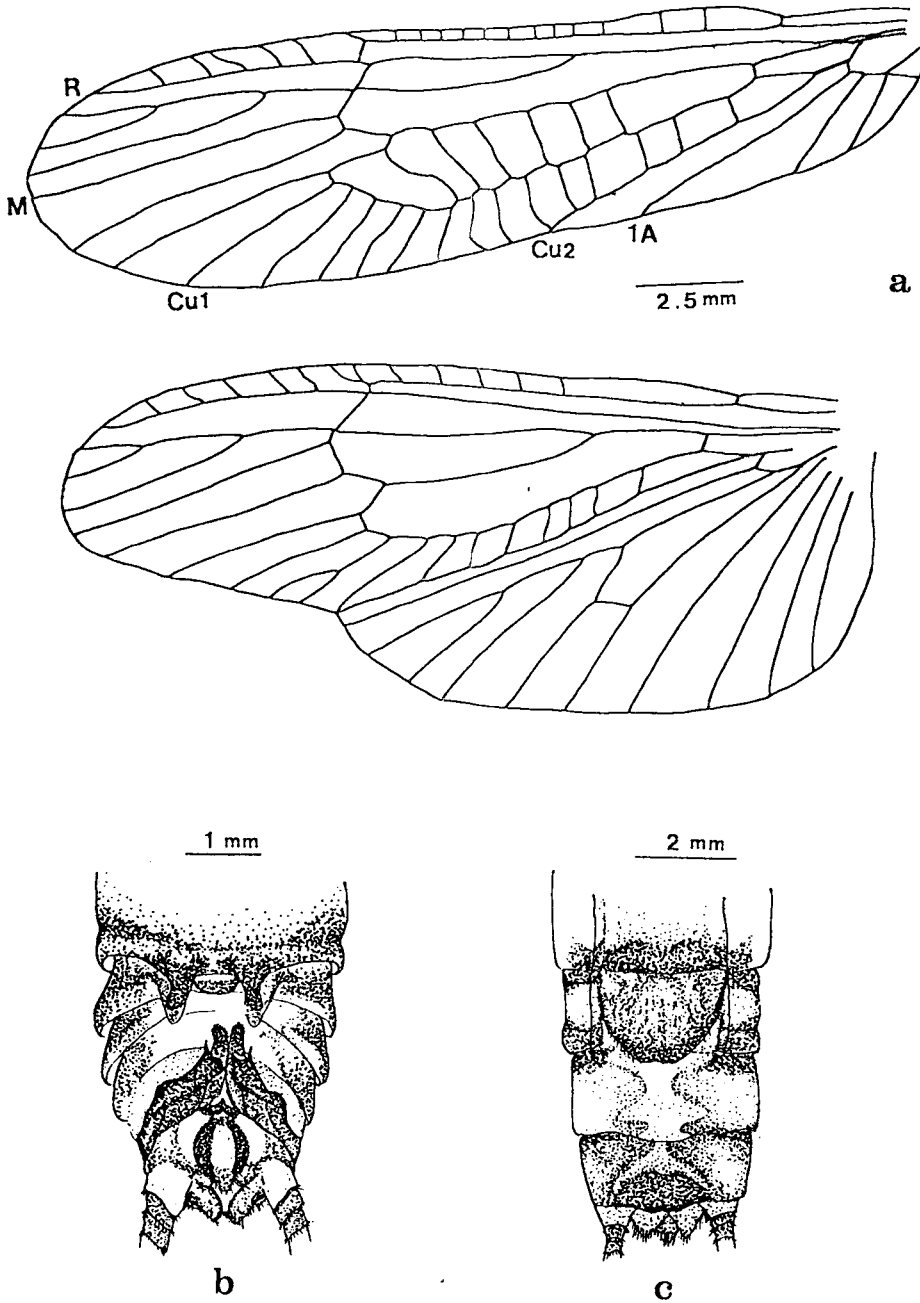


Fig. 1. *Oyamia coreana*, a wing and vein; b, male terminalia, dorsal; c, subgenital plate for female not.

be distinguished from other species. Egg of this species is recorded here for the first time in our studies.  
Distribution: Korea.

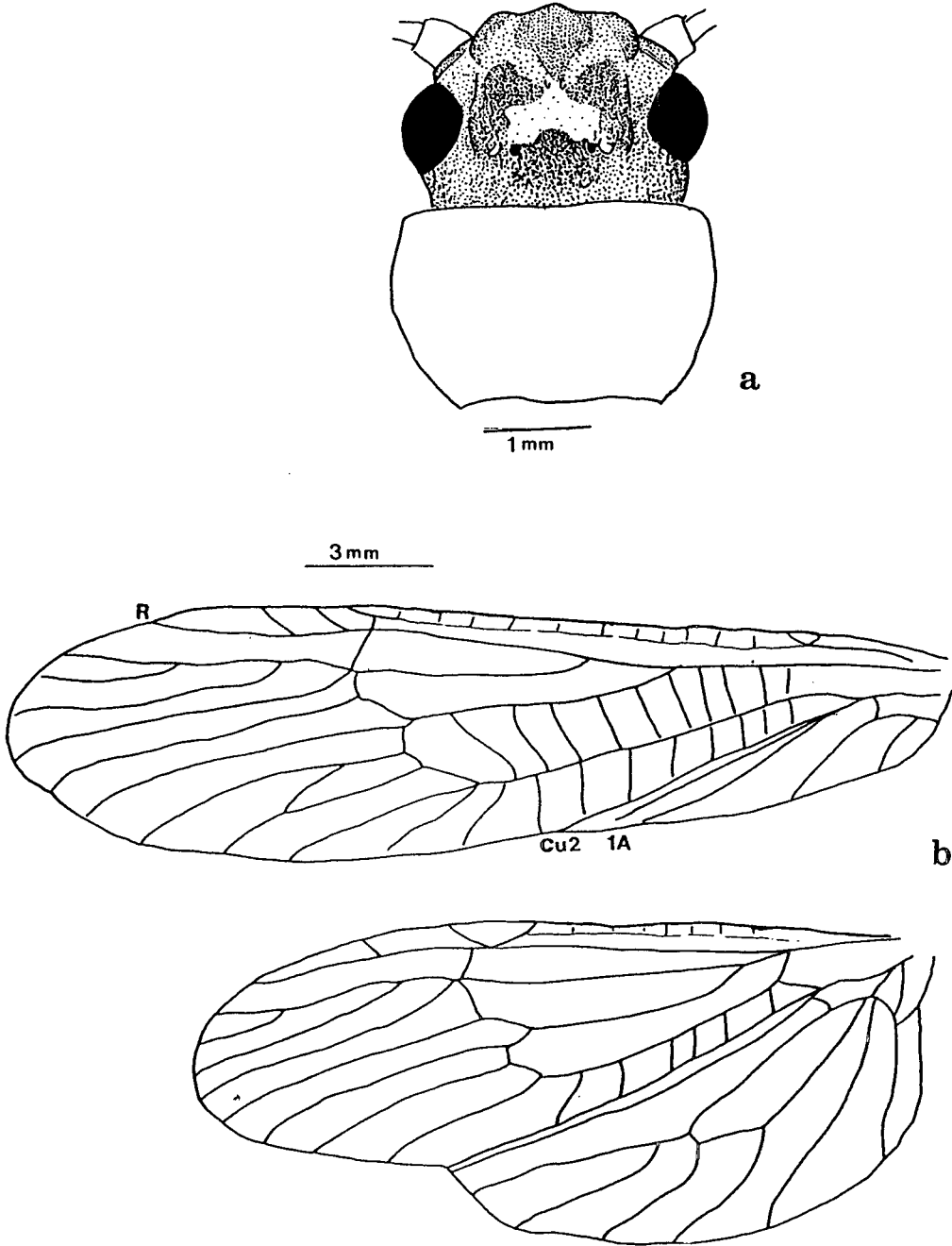


Fig. 2. *Kiotina decorata*. a, adult head and prothorax; b, wings and ven.

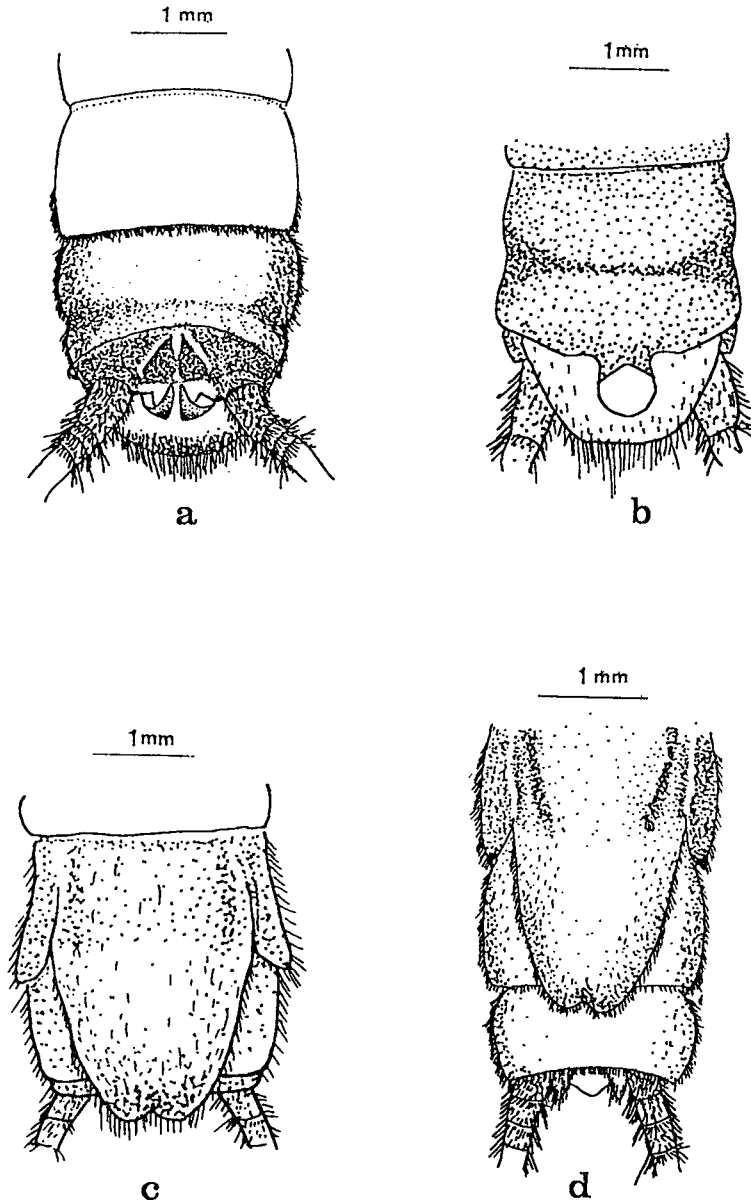


Fig. 3. *Kiotina decorata* terminalia. a, b; male, c,d; female (a,c; dorsal; b,d; ventral).

2. *Kiotina decorata* (Zwick, 1973) 무늬강도래

(Figs. 2-3, Plate 2)

Material examined: Kwangyang, 4♂, 15♀, Mt. Packun, Tongkok valley, 5. VI. 1990 (S.K. Baik and Y.G. Cho).

Description: Body length: male 20.1mm, female 24.9 mm; forewing: male 18.6 mm, female 22.1 mm,

General colour brown or blackish brown. Head with distinct light reddish pattern, and some variation (Fig. 2a). Wing brown or blackish brown with 11 costal crossveins indistinctly, 10 m1-m2 crossveins (Fig. 2b).

**Male:** 9th sternite with a large subgenital plate, set off against 9th sternite by a transverse keel, bearing anteriorly angular and posterior rounded ventral lobe, subgenital plate not sclerotized below lobe. 10th tergite with a big notch behind, embracing epiproct. It is black and shining and consisting of two sclerites fused in middle. 10th tergite with a hard process above insertion of paraproct and sharp little spine above this process. Paraprocts hook-shaped, bent up, with a subterminal spine (Figs. 3a,b).

**Female:** 8th sternite with a long tongue-shaped subgenital plate, shallowly notched distally, with a fine hairs. Plate covering 9th and 10th sternites or covering base of sternites 10 and simple blunt paraprocts (Figs. 3c,d).

**Egg:** Diameter about 410 $\mu$ m (plate 2A); attachment disc about 120 $\mu$ m, starfish shaped (plate 2B); tip of arm of attachment disc is sunflower shape. Micropyles located below two-thirds of anterior pole (plate 2C). Chorion consisted of very small particles, smooth apparently.

**Remarks:** The present adult is closely related to the Japanese species, *K. pictetii* Klapalek in general structures of the body, however, it can be distinguished from the latter by the colouration of head. Egg of this species is recorded here for the first time in our studies.

**Distribution:** Korea.

## DISCUSSION

The eggs of stoneflies can be clearly distinguished by the chorionic features. Egg morphology is useful for the identification of species and their classification (Isobe, 1988). In Perlidae, eggs of all observed species are circular in crosssection. Eggs of this family are characterized by basal plates. Systellagnathan eggs have a collar and a basal plate except those of a few species. Furthermore, micropyles are arranged circumlinearly near one end of eggs (Hinton, 1981; Isobe, 1988; Stark and Szczytko, 1988), Egg size of *Oyamia coreana* is smaller than related species that is *O. lugubris* and *O. seminigra*. Chorion of *O. coreana* which is indistinctly hexagonal plastron is distinguished from related two other species (Table. 1).

In *K. collaris* (Banks), the head has no light central spots and the epiproct is entire posteriorly (Zwick, 1973b, c).

Eggs' shape of *K. decorata* is oval without a circumlinearly swollen band and anchor is starfish-like (Table 2).

**Table 1.** The comparison of eggs morphology on *Oyamia*

Character	<i>O. coreana</i>	<i>O. lugubris</i> *	<i>O. seminigra</i> *
Length	0.37mm	0.49mm	0.50mm
Width	0.28mm	0.33mm	0.33mm
Shape	oval	oval	pear-shape
collar	with a wide stalk	short without stalk	with a wide stalk
anchor	exist	—	—
Chorion	indistinctly hexagonal plastron	smooth	almost smooth or with many punctations
Micropyles	circumlinearly	circumlinearly	circumlinearly

\*by Isobe (1988)

**Table 2.** The comparison of eggs morphology on *Kiotina*

Character	<i>K. decorata</i>	<i>K. pictetii</i> *
Length	0.41mm	0.46mm
Width	0.29mm	0.34mm
shape	oval without swollen band	oval, with a circumlinearly swollen band
collar	absent	absent
anchor	starfish-like	mushroom-like
Chorion	smooth, with very small particles	finely punctate
Micropyles	circumlinearly	circumlinearly

\* by Isobe (1988)

## ABSTRACT

Two species of Perlidae, *Oyamia coreana* and *Kiotina decorata* which were collected in mountain valley of the Chonnam, Chonguk and Kyongnam provinces, south Korea are reported for the first time from Korea, with descriptions of the external morphology of their eggs by SEM.

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Explanation of Plates

Plate 1. *Oyamia coreana*, A, entire egg, lateral; B, collar and anchor; C, micropyles.

Plate 2. *Kiotina decorata*, A, entire egg, lateral; B, collar and anchor, lateral; C, micropyles.

