

Description of Larval *Nigrobaetis bacillus* (Kluge) (Ephemeroptera: Baetidae) with a Key to the Larvae of the Baetidae in Korea

Bae, Yeon Jae, Sun Young Park and Jeong Mi Hwang

(Department of Biology, Seoul Women's University, Seoul 139-774, Korea)

깜장하루살이 (하루살이목: 꼬마하루살이과) 유충의 기재 및 한국산 꼬마하루살이과 유충의 검색표. 배연재 · 박선영 · 황정미 (서울여자대학교 생물학과)

지금까지 한국에 알려진 8속 15종(미기록종 1종 포함)의 꼬마하루살이과(하루살이목)의 유충에 대하여 속과 종의 검색표를 작성하였다. 추가되는 미기록종인 깜장하루살이(*Nigrobaetis bacillus*) 유충에 대하여는 전체그림과 함께 기재하였다.

Key words : Baetidae, Ephemeroptera, identification key, Korea, *Nigrobaetis bacillus*

INTRODUCTION

The mayfly family Baetidae is one of the most abundant aquatic insect groups in freshwater ecosystems. They are frequently found not only from lotic to lentic ecosystems, but also from clean mountain torrents to polluted urban streams. Despite of this ubiquity of the baetid mayflies, freshwater biologists or ecologists have suffered from their identification because of their insufficient taxonomic knowledge as well as their small body size (5~10 mm) (Bae, 1997).

Recent taxonomic studies of Korean Baetidae (Park et al., 1996; Bae and Park, 1997, 1998) have enabled the preparation of a comprehensive larval key to the genera and species of the family. We herein also include the description of one additional baetid species previously unknown to Korea. Materials and methods used in this paper are the same as in previous studies (see Park et al., 1996).

DESCRIPTION

Family Baetidae

Nigrobaetis bacillus (Kluge) (깜장하루살이: 신칭)

(Fig. 1)

Baetis gracilis bacillus Kluge, 1983: 61.

Nigrobaetis bacillus (Kluge): Waltz et al., 1994: 35.

Baetis (*Nigrobaetis*) *bacillus* Kluge: Novikova and Kluge, 1995: 23.

Mature larva. Dimensions (mm): Body length 4.7~5.5; antennae 2.3~2.7; forefemora, foretibiae and foretarsi 0.75, 0.5, and 0.5; midfemora, midtibiae and midtarsi 0.75, 0.5, and 0.3; hindfemora, hindtibiae and hindtarsi 0.8, 0.5, and 0.4; cerci 3.1~3.6; terminal filament 1.5~1.7.

Description: General body (Fig. 1) dark brown. Head relatively small. Antennae light brown. Labial palpi 3-articled; articles 2 2.0x length of basal article, apically broader; terminal articles apically round. Thoracic nota without distinct markings. Legs light brown; femora with ca. 8~9 apically round stout setae on outer margins (Fig. 1); foretibiae as long as foretarsi; mid and hindtibiae longer than mid and hindtarsi; claws brown. Abdominal tergum I, posterior part of IX, and X white; terga II-VIII dark brown with light submedian pairs of streaks and dots; posterior margin of abdominal tergum with pointed notches. Gills 1-7 with rudimentary tracheae. Caudal filaments light brown, without dark band;

terminal filament ca. 0.5x length of cerci.

Material examined. 20L: KW, Wonju, Chiak Mt., Chupo Cr., 1996-V-4, 1996-VII-3; 1L: KW, Yangyang, Sorak Mt., Osaek, 1995-VI-20; 1L: KW, Yongwol, Paedok Mt., 1992-VIII-11; 4L: KG, Chongpyong, Chojong Cr., 1994-VIII-24; 10L: KG, Kapyong, Kapyong Cr., 1992-IX-6; 1L: CCB, Tanyang, Sobaek Mt., Namchon Cr., 1994-IX-19; 1L: CLN, Haenam, Turyun Mt., 1993-VI-21.

Remarks. The larva of *N. bacillus* can be distinguished from that of *N. acinaciger* Kluge (1983) by the characters of lacking white median line on dorsal body and lacking dark band on cerci. *N. bacillus* possesses gill lamellae on abdominal segment I which are absent in *N. acinaciger*. The generic status of *Nigrobaetis* was revalidated by Waltz and McCafferty (1997).

Distribution. Far East Russia (Primorye), Korea.

KEY TO THE GENERA AND SPECIES OF THE BAETIDAE OF KOREA

- 1. Gills one-six paired and gills seven single (in *Procloeon maritimum* gills one-seven single); every 4th segment of caudal filaments prominent (Figs. 2 and 3). 2
 - Gills one-seven single; every 4th segment of caudal filaments not prominent (Figs. 4 and 5). 5
- 2. Posterior margin of abdominal tergum X round, with row of spines; lateral spines not enlarged (Fig. 2).
 - *Cloeon dipterum* (두날개 하루살이)
 - Posterior margin of abdominal tergum X straight, with row of spines; lateral spines enlarged (Fig. 3). 3
- 3. Gills one-seven single.
 - *Procloeon maritimum* (작은갈고리 하루살이)
 - Gills one-six paired and gills seven single. 4
- 4. Claws ca. 1/3x length of tarsi (Fig. 6); body relatively large (8~13 mm).
 - *Procloeon halla* (한라 하루살이)
 - Claws ca. 1/2x length of tarsi (Fig. 7); body relatively small (6~8 mm).
 - *Procloeon pennulatum* (갈고리 하루살이)
- 5. Tails two or three; if tails three terminal filament < 0.5x length of cerci. 6
 - Tails three with terminal filament > 0.5x length of cerci. 8
- 6. Tails longer than body length; dorsal abdomen

with median tubercles (Fig. 8).

- *Baetiella tuberculata* (애호랑 하루살이)
- Tails shorter than body length; dorsal abdomen without tubercles (Fig. 9). 7
- 7. Tails two. *Acentrella sibirica* (콩알 하루살이)
 - Tails three. *Acentrella gnom* (깨알 하루살이)
- 8. Body elongated and laterally compressed; paraproct in ventral terminal abdomen with prolongation (Fig. 10).
 - *Alainites muticus* (길쭉 하루살이)
 - Body not elongated and laterally round; paraproct without prolongation (Fig. 11). 9
- 9. Labial palpi enlarged (Fig. 12); terminal maxillary palpi excavate.
 - *Labiobaetis atrebatinus* (입술 하루살이)
 - Labial palpi not enlarged (Fig. 13); terminal maxillary palpi not excavate. 10
- 10. Body dark brown. 11
 - Body light brown. 12
- 11. Gills on abdominal segment II-VII; gills VI-VII narrow and apically pointed (Fig. 4); body dorsally with median white stripe.
 - *Nigrobaetis acinaciger* (흰줄감장 하루살이)
 - Gills on abdominal segment I-VII; gills VI-VII oval and apically round (Fig. 5); body dorsally without median white stripe (Fig. 1).
 - *Nigrobaetis bacillus* (감장 하루살이)
- 12. Hind thorax and wingpads white; abdominal segment II-III and V-VIII with light round markings (Fig. 16); body length < 5mm.
 - *Baetis ursinus* (빙울 하루살이)
 - Body color various; body length > 5 mm. 13
- 13. Abdominal posterior margin with round notches (Fig. 14). *Baetis pseudothermicus* (나도꼬마 하루살이)
 - Abdominal posterior margin with pointed notches (Fig. 15). 14
- 14. Abdominal tergum II-VIII with distinct dark submedian streaks and dots (Fig. 17).
 - *Baetis silvaticus* (감초 하루살이)
 - Abdominal tergum II-VIII without distinct dark submedian streaks and dots (Fig. 18).
 - *Baetis fuscatus* (개똥 하루살이)

ABSTRACT

A comprehensive larval key to the genera and species of Korean Baetidae (Ephemeroptera) is provided for 14 previously known and one newly recorded species in eight genera. For the additional species, *Nigrobaetis bacillus* (Kluge), lar-

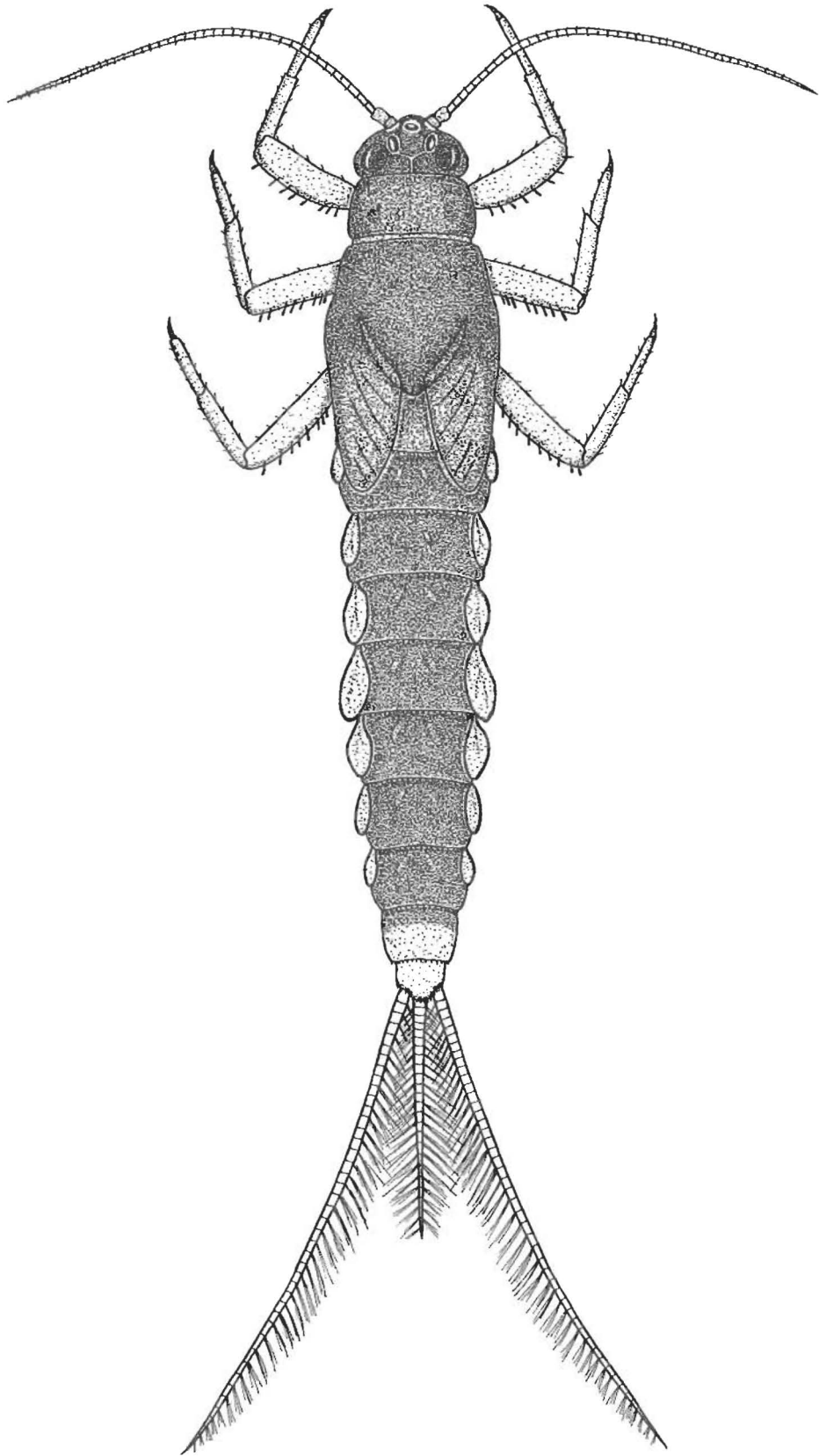
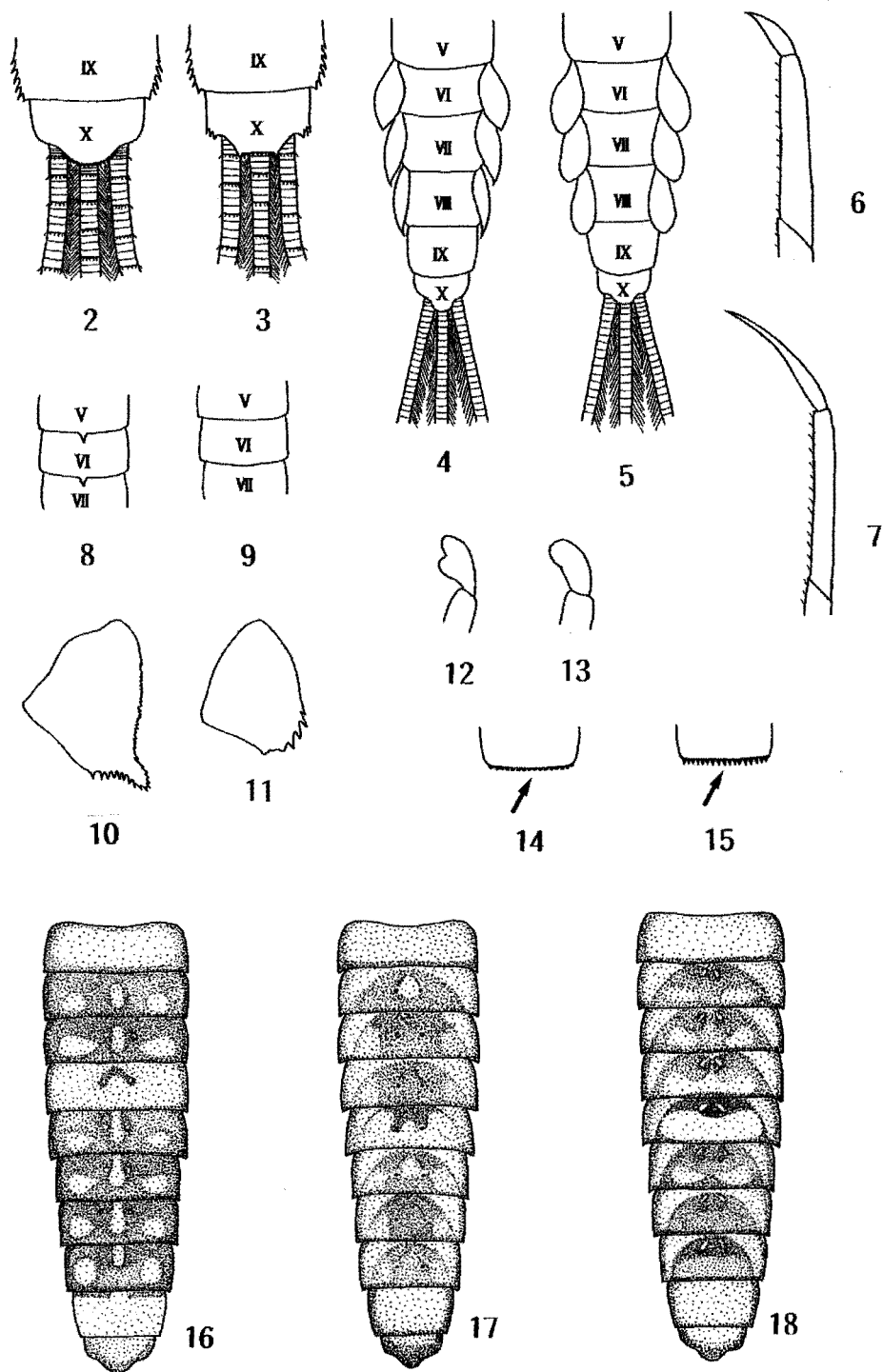


Fig. 1. *Nigrobaetis bacillus*, larval habitus.



Figs. 2-18. Larval parts of the Baetidae: (2) *Cloeon dipterum*, terminal abdomen and basal caudal filaments, (3) *Procloeon maritimum*, terminal abdomen and basal caudal filaments, (4) *Nigrobaetis acinaciger*, abdomen and basal caudal filaments, (5) *N. bacillus*, abdomen and basal caudal filaments, (6) *P. halla*, foretarsus and claw, (7) *P. pennulatum*, foretarsus and claw, (8) *Baetiella tuberculata*, dorsal abdomen, (9) *B. sibirica*, dorsal abdomen, (10) *Alainites muticus*, paraproct, (11) *Labiobaetis atrebatinus*, paraproct, (12) *L. atrebatinus*, terminal labial palp, (13) *N. acinaciger*, terminal labial palp, (14) *Baetis pseudothermicus*, abdominal posterior margin, (15) *B. silvaticus*, abdominal posterior margin, (16) *B. ursinus*, dorsal abdomen, (17) *B. silvaticus*, dorsal abdomen, and (18) *B. fuscatus*, dorsal abdomen.

val description is provided with its larval habitus.

ACKNOWLEDGEMENTS

This work was supported by the Korea Science and Engineering Foundation (project # 961-0508-063-2).

REFERENCES

- Bae, Y.J. 1997. A historical review of Ephemeroptera systematics in Northeast Asia. pp. 405-417. In: *Ephemeroptera & Plecoptera: Biology-Ecology-Systematics* (Landolt, P. and M. Sartori, eds). MTL, Fribourg, Switzerland.
- Bae, Y.J. and S.Y. Park. 1997. Taxonomy of *Cloeon* and *Procloeon* (Ephemeroptera: Baetidae) in Korea. *Korean J. Syst. Zool.* **13**: 303-314.
- Bae, Y.J. and S.Y. Park. 1998. *Alainites*, *Baetis*, *Labiobaetis*, and *Nigrobaetis* (Ephemeroptera: Baetidae) in Korea. *Korean J. Syst. Zool.* **14**: 1-12.
- Kluge, N.Ju. 1983. New and little known mayflies of the fam. Baetidae (Ephemeroptera) from the Primorye. *Entomol. Rev.* **61**: 53-68.
- Novikova, E.A. and N.Ju. Kluge. 1995. Mayflies of the subgenus *Nigrobaetis* (Ephemeroptera, Baetidae, *Baetis* Leach, 1815). *Entomol. Rev.* **74**: 16-39.
- Park, S.Y., Y.J. Bae and I.B. Yoon. 1996. Revision of the Baetidae of Korea. (1) Historical review, *Acentrella* Bengtsson and *Baetiella* Uéno. *Entomol. Res. Bull.* (KEI), Seoul **22**: 55-66.
- Waltz, R.D. and W.P. McCafferty. 1997. New generic synonymies in Baetidae (Ephemeroptera). *Entomol. News* **108**: 134-140.
- Waltz, R.D., W.P. McCafferty and A. Thomas. 1994. Systematics of *Alainites* n. gen., *Dipheter*, *Indobaetis*, *Nigrobaetis* n. stat., and *Takobia* n. stat. (Ephemeroptera, Baetidae). *Bull. Soc. Hist. Nat.*, Toulouse, **130**: 33-36.