

# Preliminary Study on the Hymenopterous Parasites of Rice Stem Borers with Description of Two Previously Unrecorded Species from Korea.

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二化螟虫 寄生蜂에 관한 研究—韓國未記錄 2種을 包含하여

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## ABSTRACT

An intensive survey of rice insect pests and their natural enemies with special references on parasites of rice stem-borers was made during the last 5 years(1973-77). The results were obtained as follows:

1. 15 species of hymenopterous parasites from the rice stem-borers were identified; Trichogrammatidae-2 spp, Scelionidae-1 sp, Braconidae-5 spp, Ichneumonidae-7spp.
2. The two Trichogrammatids species, *Apanteles chilonis* and *Microgaster russata* are first records from Korea.
3. Museum presence specimens of the 3 species: *Trichogramma chilonis*, *Eriborus terebrans* and *Gambrus ruficoxatus*, we previously identified in Korea, could not be located in this periods of study.

## INTRODUCTION

Two species of stem-bores, *Chilo suppressalis* and *Sesamia inferens* are important pests of rice in Korea. *Sesamia inferens* is distributed in only southern areas, and damage is not so serious in Korea.

About 100 species of natural enemies, including parasites and predators, as well as diseases, have been recorded for rice stem borers in Asia, eg. 56 species from *Chilo. suppressalis*, 16 species from *Sesamia inferens* and 40 species from *Tryporyza incertulas*.<sup>(20)</sup>

In Korea, 10 species of hymenopterous parasites of stem-borers were recorded by Kim (1970) in his Encyclopedia of Hymenopterus Insects Fauna. Momoi

(1975) reported 47 species of hymenopterous parasites from the rice stem-borers.<sup>(10)</sup>

Extensive survey and parasitism studies were conducted in 1938-39 and 1946-59 by Chun (1958) who also tried to mass produce and release egg parasites of *Trichogramma japonicum* for the control of striped rice borer.<sup>(6)</sup>

For establishing the integrated control of rice insect pests, we have collected samples from rice paddies and banks. Samples were collected and reared out in the laboratory.

The followings are the main results obtained during the last 5 years, as preliminary studies on the identification and biology of parasite species of stem-borers.

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## MATERIALS AND METHODS.

Adult parasites were collected from the paddies or

banks during the season by D-VAC suction machine or sweepnetting. Egg masses were picked from the leaves out and kept in test tubes for hatching. Larvae and pupae were confined in small vials on rice stems to allow for pupation and emergence. All specimens collected were preserved in alcohol and were examined under the microscope for identification.

**Table 1.** List of Hymenopterous Parasites of Rice Stem-Borers from Korea. (1977)

Parasite species	Hosts		Stage attacked
	<i>Chilo suppressalis</i>	<i>Sesamia inferens</i>	
Trichogrammatidae			
1. <i>Trichogramma japonicum</i>	×	×	Egg
2. <i>T. chilonis</i>	×		Egg
Scelionidae			
3. <i>Telenomus dignus</i>	×		Egg
Braconidae			
*4. <i>Apanteles chilonis</i>	×		Larva
5. <i>Bracon onukii</i>	×	×	Larva
6. <i>B. chinensis</i>	×	×	Larva
7. <i>Chelonus munakatae</i>	×		Egg-larval
*8. <i>Microgasta russata</i>	×		Larva
Ichneumonidae			
9. <i>Agrothereutes lanceolatus</i>	×		Larva
10. <i>Eriborus terebrans</i>		×	Larva
11. <i>Gambrus ruficoxatus</i>	×		Larva
12. <i>Itopectis narangae</i>	×		Pupa
13. <i>Temelucha biguttula</i>	×		Larva
14. <i>Trathala flavoorbitalis</i>	×		Larva
15. <i>Xanthopimpla punctata</i>	×		Pupa

\*The first authorized record of the species from Korea.

### 1. *Trichogramma japonicum* ASHMEAD 1904

Specimens examined: 2♂♂, 1♂. 21-VI-74; Suweon, 1♀, 3♂♂. 26-IX-74; Iri.

This is one of the principal egg parasitoids of rice stem borers, having been known to be widely-distributed in Korea. The first studies on egg parasitism were carried out during 1938-39 when 22 areas were surveyed throughout the country<sup>(1)</sup>. Fairly high rates were recorded in the periods 1946-59, with incidence

varying from 49.5-100% (mean of 81.6%) on egg basis<sup>(2)</sup>. The rates of parasitism have decreased markedly in recent years, with only 6% parasitism reported in the first generation in 1973<sup>(4)</sup>. A drastic decrease in numbers of this parasitoid have been observed over the last 15 years. This decrease in numbers of parasitoids may have close connection to the scarcity of an unrecorded alternative dipteran host species, *Sepedon* sp (Sciomyzidae). It is possible

the increased use of insecticides may have also killed this marshfly in rice paddies.

Hosts: *Chilo suppressalis*, *Sesamia inferens*

Distribution: Korea, Japan, China, Taiwan, Vietnam, Thailand, Burma, Malaysia, India, Indonesia, Philippines.

## 2. *Trichogramma chilonis* ISHII 1941

This parasite was first recorded by Kim in 1970. But in our collection of materials, he could not find a single specimen of this species.

Host: *Chilo suppressalis*

Distribution: Korea (?), Japan, Taiwan, Philippines.

## 3. *Telenomus dignus* (GAHAN) 1925

Specimens examined: 1♀, 3♂♂. 11-VII-74; Suweon

This species was previously misidentified as *Phanurus beneficus* Z. It was especially noted and recorded from north Korea in 1938-39. Significant decreases in the incidence of this parasite have also been observed during the past 15 years.

Host: *Chilo suppressalis*

Distribution: Korea, Japan, China, Cambodia, India, Sri Lanka, Philippines.

## 4. *Apanteles chilonis* [MUNAKATA] 1912

Specimens examined: 3♀♀, 2♂♂. 28-VI-73; Suweon, 37♀♀, 26♂♂. 29-III-75; Goyang, 5♀♀, 7♂♂. 3-IV-75; Sosa, 2♀♀, 2♂♂. 4-XI-74; Milyang

This parasite is a gregarious endoparasite of stem borer larvae. This species is one of the principal parasites of *Chilo* larvae in Korea, with wide distribution in central areas. Parasitization was fairly high in Goyang in 1975, with a rate of 10.3% of the overwintering *Chilo* larvae.

Host: *Chilo suppressalis*

Distribution: Korea, Japan, Pakistan (Introduced)

## 5. *Bracon onukii* (WATANABE) 1932

Specimens examined: 1♀, 1♂. 2-X-73; Suweon, 2♀♀, 8-VIII-74; Suweon, 2♀♀, 8-VIII-74; Suweon

This species is regarded as one of the most important parasites of rice stem-borers larvae.

Hosts: *Chilo suppressalis*, *Sesamia inferens*

Distribution: Korea, Japan, Ryukyu.

## 6. *Bracon chinensis* SZEPLIGETI 1902

Specimens examined: 1♀, 3♂♂. 8-VIII-74; Suweon

This is a larval parasite of stem-borers. This species has been recorded by Kim (1970) in Korea. This

parasite was introduced from China into Hawaii in 1928 for the control of rice stem-borer.

Hosts: *Chilo suppressalis*, *Sesamia inferens*

Distribution: Korea, China, Japan, Taiwan, Malaysia, Philippine, Ryukyu Is.

## 7. *Chelonus munakatae* [MUNAKATA] 1912

Specimens examined: 2♀♀, 2-IV-75; Sosa

This parasite bred from the overwintering larvae which were kept under a fixed temperature condition. The egg is laid in the host egg and larva emerged from the mature larvae.

Host: *Chilo suppressalis*

Distribution: Korea, Japan, China,

## 8. *Microgasta russata* HOLIDAY 1834

Specimens examined: 2♀♀, 3♂♂. 26-III-73; Suweon, 2♀♀, 1♂. 3-VII-74; Suweon, 15♀♀, 18♂♂. 6-IV-75; Sosa

This species is an endoparasite of rice stem-borer larvae. Adults are active in June and September. Even in July and August when *Apanteles chilonis* is not active, many were also reared from the overwintering larvae of stem-borer. This is the first authorized record of the species from Korea.

Host: *Chilo suppressalis*

Distribution: Korea, Japan, Europe

## 9. *Agrothereutes lanceolatus* (WALKER) 1874

This species was previously recorded by Kim 1956. He collected specimens in Gwangnung and Seoul areas. This is a larval parasite of striped rice-borers.

Host: *Chilo suppressalis*

Distribution: Korea, Japan

## 10. *Eriborus terebrans* (GRAVENEORST) 1829

Momoi (1968) reported that this species was distributed in Korea, but I could not find this species during my intensive survey of paddies in the last 5 years. Kim also did not mention about this species. There is a possibility of distribution in the far southern part of Korea in which *Sesamia inferens* commonly occurs.

Host: *Sesamia inferens*

Distribution: Korea(?), Japan, China, Micronesia, Europe.

## 11. *Gambrus ruficoxatus* (SONAN) 1930

According to Momoi (1968), he reported this species was distributed in Korea. Up to now, no one has described this species in Korea. Dr. Yasumatsu has

checked out all materials which were collected from paddies in 1973-74. He also was not able to identify this species in Korea.

Host: *Chilo suppressalis*

Distribution: Korea(?), Japan, Kuriles.

#### 12. *Itoplectis narangae* (ASHMEAD) 1906

Specimens examined: 2♀♀. 23-V-73; Suweon

Kim collected and described this species in 1955. He also described parasitism this species on *Naranga aenescens* and *Sesamia inferens*. This species was originally described as a parasite of *Naranga aenescens* from Japan with the name of *naranyae*, which was an incorrect spelling. It was corrected *naranga*. This is an endoparasite of stem borer pupae.

Hosts: *Chilo suppressalis*, *Naranga aenescens*

Distribution: Korea, Japan, China, Hawaii, Mexico, Ryukyu Is.

#### 13. *Temelucha biguttula* [MUNAKATA] 1910

Specimens examined: 1♀, 23-IV-73; Suweon, 3♀♀, 1♂. 29-III-75; Suweon, 3♀♀, 1♂. 2-IV-75; Sosa, 2♀♀. 7-IV-75; Goyang.

This species is solitary endoparasite of rice stem borers. Many specimens were collected from the overwintering larvae of striped rice borers. Before the introduction of new insecticides in Japan, this parasite was a most effective larval parasite of stem-borer.

Host: *Chilo suppressalis*

Distribution: Korea, Japan, China, Hawaii

#### 14. *Trathala flavorbitalis* (CAMERON) 1907

According to Kim (1970), *T. flavorbitalis* f. *coreans* UCHIDA is more abundant than the original species in Korea. He collected many specimens from several different areas: Suweon, Juul, Gupo, Onjeongri and Seoul. Both species are larval parasites of rice stem borers. *Chilo* is not considered to be the chief host insect in Korea. Yasumatsu and I were not able to catch this specimen from rice paddies during the last 5 years in the Suweon area. It seems to have other alternative hosts, such as deciduous fruit pests.

Host: *Chilo suppressalis*

Distribution: Korea, Japan, China, Taiwan, Malaysia, Burma, India, Sri Lanka, Philippines, Fiji, Micro-

nesia, Hawaii.

#### 15. *Xanthopimpla punctata* (FABRICIUS)

1781

According to Kim (1970), he caught this species from Jeju Is. This species is pupal parasite of stem-borers.

Host: *Chilo suppressalis*

Distribution: Korea, Japan, Ryukyus, Taiwan, China, Malaysia, India, Pakistan, Afganistan, Sri Lanka, Sarawak, Philippines, Mauritius.

#### 摘 要

1973~75년까지 5 個年間 水稻에서 採集한 標本과 文獻을 通하여 二化螟虫의 寄生蜂만을 重點하여 調査分析한 結果는 다음과 같다.

1. Trichogrammatidae 2 種, Scelionidae 1 種, Braconidae 5 種, Ichneumonidae 7 種 등 모두 15 種이 發見되었다.
2. 이중 *Apanteles chlonis* 와 *Microgaster russata* 등 2 種은 韓國未記錄種임이 밝혀졌다.
3. *Trichogramma chilonis*, *Eriborus terberans* 그리고 *Gambrus ruficoxatus* 등의 3 種은 文獻에만 記錄되었을뿐 本調査期間中 實際로 標本을 確認할 수 없었다.

#### REFERENCES CITED

1. Anonymous, 1939. Ann. Rep. Agr. Exp. Sta., Suweon. part 1.
2. Anonymous, 1947. Ann. Rep. Agr. Exp. Sta., Suweon. p. 185
3. Anonymous, 1971. Research on rice borers, related pests and their natural enemies. The XII Pacific Science Congress, Symp. No. 9A. 1, Aug. 1971, Canberra.
4. Anonymous, 1973. Ann. Res. Rep. IAS/UNDP. p. 101~126.
5. Chun, H. K. 1968. Ann. Rep. Sta., Suweon. Part 2:404-11
6. Katayama, E. 1971. Hymenopterous parasites of the rice stem-borer, *Chilo suppressalis* WALKER, bred from the hibernating host larvae which were kept under a fixed temperature condition. Jap. J. Appl. Ent. Zool. 15(3):169-72
7. Kim, C. W. 1963. Catalogue of Hymenoptera from Korea. The humanities and sciences, natural

- science, 10th anniversary, Korea Univ. 6.
8. Kim, C.W. 1970. Illustrated Encyclopedia of Fauna and Flora of Korea. Vol. 11. Insecta (III), Min. of Education.
  9. Momoi, S. 1968. A key to Ichneumonid parasites of rice stem borers in Asia. *Mushi* 41 (13):175-84
  10. Momoi, S., C. Watanabe, K. Yano. and K. Yasumatsu. 1975. Revision of rice stem-borers, their parasites and the family Sciomyzidae in South and East Asia. *In* Approaches to biological control. JIBP Synthesis Vol. 7:69-80, Tokyo.
  11. Nishida, T. and T. Torii. 1970. Rice stem-borers and their natural enemies. p. 16-34. IBP Handbook No. 14. F. A. Davis Co. Philadelphia, Pa.
  12. Paik, W. H. 1967. Insect pests of rice in Korea. p. 668-69. *In* Proc. Symp. Major insect pests of the rice plant. IRRI. Los Banos, Philippines. 1964. Johns Hopkins Press, Baltimore.
  13. Shin, Y.H. 1970. On the bionomics of *Itopectis narangae* (Ashmead) (Ichneumonidae, Hymenoptera). *Jour. of the Faculty of Agriculture, Kyushu Univ.* Vol. 16, No. 1, p. 75
  14. Watanabe, C. 1966. Notes on Braconid and Ichneumonid Parasites of the rice borer, *Chilo suppressalis* (Walker) in Japan. *Mushi* 39(8):95-101
  15. Watanabe, C. 1967. Notes on Braconidae caught in sweep-net at paddy fields. Part I. *Mushi* 40 (15): 189-98
  16. Watanabe, C. 1968 Identification of the Braconid parasites of rice stem-borers (Hymenoptera: Braconidae). *Mushi* 41:185-88
  17. Yasumatsu, K. 1966. Distribution and bionomics of natural enemies of rice stem-borers (Research on the natural enemies of rice control). The 11th Pacific Science Congress Symp. No.28. p.33-44. Tokyo.
  18. Yasumatsu, K. 1967. The possible control of rice stem-borers by the use of natural enemies. *In* Proceedings of symp. Major insect pests of the rice plant. IRRI. Los Banos, Philippines. 1964. John Hopkins Press. p.431-42. Baltimore.
  19. Yasumatsu, K. 1975. Preliminary studies on the taxonomy of natural enemies of agricultural pests for the development of integrated control programmes. IAS/UNKPP/Korea, Working paper No. 15 p.32
  20. Yasumatsu, K. and T. Torii. 1968. Impact of parasites, predators and diseases on rice pests. *Ann. Rev. Ent.* 13:295-324
  21. Yoon, J. K. 1958. Studies on the parasites of rice stem-borer in Gwangju area. *Bull. Chunnam Univ.* p. 68-92.