THE HYMENOPTEROUS PARASITOIDS OF THE DIAMONDBACK MOTH, PLUTELLA XYLOSTELLA (LEPIDOPTERA, YPONOMEUTIDAE) IN JAPAN

Hirashima, Yoshihiro
Abe, Masaki
Tadauchi, Osamu
Konishi, Kazuhiko
他

http://hdl.handle.net/2324/2515

出版情報：ESAKIA. 28, pp.63–73, 1989-03-03. 九州大学農学部昆虫学教室
バージョン：published
権利関係：
THE HYMENOPTEROUS PARASITOIDS OF THE DIAMONDBACK MOTH, *PLUTELLA XYLOSTELLA* (LEPIDOPTERA, YPONOMEUTIDAE) IN JAPAN*

**YOSHIHiro HIRASHIMA, MASAKI ABE, OSAMU TADAUCHI**

Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka 812, Japan

**KAZUHIKO KONISHI**

Laboratory of Insect Systematics, National Institute of Agro-Environmental Sciences, Tsukuba 305, Japan

and

**KAORU MAETO**

Entomological Laboratory, Forestry and Forest Research Institute, Sapporo 004, Japan

Abstract

Hymenopterous parasitoids of the diamondback moth occurring in Japan are summarized as follows (species with an asterisk indicates secondary parasitoid and a dagger shows the primary and secondary parasitoid):

**Braconidae**

*Apanteles plutellae* Kurdjumov

**Ichneumonidae**

*Diadegma* sp. 1
*Diadegma* sp. 2
*Diadromus subtilicornis* (Gravenhorst)
*Coccygomenus nipponicus* (Uchida)
†*Illopectis alternans spectabilis* (Matsumura)
†*Illopectis narangae* (Ashmead)
*Gelis* sp.

**Trichogrammatidae**

*Trichogramma chilonis* Ishii

**Eulophidae**

---

* Contribution from the Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka (Ser. 3, No. 292).
Tetrastichus sokolowskii Kurdjumov
Chalcididae
Brachymyria excarinata Gahan
Pteromalidae
*Trichomalopsis oryzae* Kamijo et Grissell
*Dibrachys* sp.

**Introduction**

The diamondback moth, *Plutella xylostella* (Linnaeus) is a serious pest of cruciferous vegetables throughout the world.

In Japan, the diamondback moth was a minor pest before 1965 (Koshihara, 1986), but recently it has become one of the most serious pests of cruciferous vegetables such as cabbages, radishes and turnips. This is partly because of the development of resistance to pesticides in this species owing to frequent use of them.

Biological control of the diamondback moth may be effective if we can find any good control agents. In order to know useful parasites and predators of the diamondback moth in Japan, we have conducted field surveys from 1986 incorporated with Prof. T. Miura of Shimane University and Prof. K. Nohara of Kyushu Tokai University.

This paper reports the occurrence of the hymenopterous parasitoids of the diamondback moth in Japan as a part of the result of our investigation.

**Materials and Methods**

From the spring of 1986 to the autumn of 1987, eggs, larvae and pupae of the diamondback moth were collected in the field at the following localities in Japan.


**Tottori Pref.**: Hyonosen, Yazu-gun, 7. x. 1987 (Y. Hirashima & M. Abe).
Oita Pref.**: Yoshibu, Kusu-gun, 21. v. 1986 (Y. Abe); 31. viii. 1986 (0. Tadauchi & M. Abe); 3. ix. 1987 (M. Abe & 0. Imoto).
HYMENOPTEROUS PARASITOIDS OF THE DIAMONDBACK MOTH


The samples brought in the laboratory were placed in rearing cages kept under room temperature. If necessary, fresh host plant material was supplied. These samples were checked daily for emergence of the parasitoids.

Results

Ten species of hymenopterous parasitoids attacking the diamondback moth were obtained as listed below. Seven of them are primary parasitoids, one is a primary and secondary parasitoid, and two are secondary ones.

BRACONIDAE

1. Apanteles plutellae Kurdjumov
   [Japanese name: Konaga-samurai-komayu-bachi] (Fig. 1)


   Material examined: 325♂ 280 ♀ from the following localities: Gunma Pref.: Tsumagoi, Azuma-gun, Yamanashi Pref.; Kitakoma-gun. (Nagasaki, Kobuchizawa, Ooizumi). Nagano Pref.: Chiisagata-gun (Aoki, Tobu, Wada); Kitasaku-gun (Kurizawa); Komoro; Nagano; Sarashina-gun (Ooka); Minamisaku-gun (Koumi, Usuda, Yachiho); Suwa-gun (Fujimi); Higashichisagata-gun (Sakai); Susaka; Chino. Tottori Pref.: Yazu-gun (Hyonosen). Fukuoka Pref.: Fukuoka (Shimobaru). Oita Pref.: Kusu-gun (Yoshiku). Kumamoto Pref.: Aso-gun (Choyo, Kugino, Takamori, Ichinomiya); Kikuchi-gun (Ozu). Miyazaki Pref.: Miyazaki. Kagoshima Pref.: Aira-gun (Mizobe); Okuchi. Okinawa Pref.: Okinawa Is. (Sashiki, Motobu).

   Biological notes: Solitary endophagous primary parasitoid of larvae; multivoltine with high percentage parasitism from late spring to early summer (Matsuura, 1977; Yamada & Yamaguchi, 1985; present study).
Fig. 1. *Apanteles platellae* Kurdjumov, ♀ Habitus in lateral view. Scale: 1.0 mm.
ICHNEUMONIDAE

2. *Diadegma* sp. 1
(Fig. 2)

*Material examined:* Kumamoto Pref.; 2♂♂, Ozu, Kikuchi-gun, 21 v. 1986 (K. Ishikawa); 1♀, Choyo, Aso-gun, 27 v. 1986 (K. Ishikawa); 1♀, same locality and collector, 10 vi.; 1♀, Kugino, Aso-gun, 6 v. 1987 (M. Abe).

*Fig. 2.* *Diadegma* sp. 1. Q. A, habitus in lateral view; B, head in dorsal view; C, propodeum in dorsal view; D, apex of abdomen in dorsal view. Scales: A, 1.0 mm; B-D, 0.5 mm.
Y. HIRASHIMA ET AL.

BIOLICAL NOTES: Solitary endophagous primary parasitoid of larvae.

REMARKS: Matsuura (1977) and Yamada & Yamaguchi (1985) recorded Diadegma sp., but we found two Diadegma-species parasitizing the diamondback moth in this study. We do not know which one is the species previously recorded.

3. Diadegma sp. 2

MATERIAL EXAMINED: Kumamoto Pref.: 1♀, Ozu, Kikuchi-gun, 13. v. 1986 (K. Ishikawa); 1♀, same locality and collector, 4. vi. 1986; 2♀♀, Kugino, Aso-gun, 10. vi. 1987 (M. Abe).

BIOLICAL NOTES: Solitary endophagous primary parasitoid of larvae.

REMARKS: This species is easily distinguished from the preceding species by the absence of the 2nd intercubitus and the short ovipositor which is as long as the apical depth of abdomen.

4. Diadromus subtilicornis (Gravenhorst)
(Fig. 3)


BIOLICAL NOTES: Solitary endophagous primary parasitoid of prepupae and pupae; multivoltine (Matsuura, 1977; Yamada & Yamaguchi, 1985). According to our investigation, the percentage parasitism of this species was high from late May to June in Aso-nango-dani, Kumamoto Prefecture.

5. Coccygominus nipponicus (Uchida)


MATERIAL EXAMINED: Kumamoto Pref.: 1♂, Choyo, Aso-gun, 10. vi. 1986 (K. Ishikawa).

6. *Itoplectis alternans spectabilis* (Matsumura)

[Japanese name: Matsu-kemushi-hirata-himebachi]


**Material Examined**: Kumamoto Pref.: 1♂, Choyo, Aso-gun, 26. vi. 1986 (K. Ishikawa).

**Biological Notes**: Solitary endophagous primary and secondary parasitoid of pupae. The host range is very wide; 34 species of Lepidoptera, 2 species of Coleoptera (Curculionidae and Chrysomelidae) and 4 species of Hymenoptera (Ichneumonidae and Braconidae) were recorded as the

7. *Gelis* sp. (new record)


**Biological Notes:** Solitary endophagous secondary parasitoid emerging from the pupa of *Apaneles pluteellae*.

**Trichogrammatidae**

8. *Trichogramma chilonis* Ishii

[Japanese name: Meaka-tamagobachi]


**Material Examined:** Shimane Pref.: 1♀, 36, Izumo, 9. vii. 1986 (T. Miura).

**Biological Notes:** Solitary endophagous primary parasitoid of eggs; multivoltine with high percentage parasitism from late May to the summer (Iga, 1985).

**Eulophidae**

9. *Tetrastichus sokolowskii* Kurdjumov


**Material Examined:** 320♀♂, 5606 ♀ from the following localities: Nagano Pref.: Chisagata-gun (Tobu); Komoro; Nagano; Minamisaku-gun (Usuda); Suwa-gun (Fujimi); Kitakoma-gun (Ooizumi); Chino. Tottori Pref.; Yazu-gun (Hyonosen). Kumamoto Pref.: Aso-gun (Choyo, Ichinomiya, Kugino, Takamori); Kikuchi-gun (Ozu). Miyazaki Pref.: Miyazaki.

**Biological Notes:** Gregarious endophagous primary parasitoid of larvae-pupae; multivoltine with high percentage parasitism from early summer to early autumn (Yamada & Yamaguchi, 1985). We also confirmed the statement of Yamada & Yamaguchi, 1985.

**Pteromalidae**

10. *Trichomalopsis oryzae* Kamijo et Grissel (new record)

**Material Examined:** Kumamoto Pref.: 1♀, Kugino, Aso-gun, 10. vi. 1987 (M. Abe).
BIOLOGICAL NOTES: Solitary endophagous secondary parasitoid attacking *Apanteles plutellae*.

According to Kamijo & Grissell (1982), this species was known as the primary parasite of *Oulema oryzae* (Kuwayama), *Buccatrix pyrivorella* Kuroko, *Agromyza oryzae* Munakata, *Hydrellia griseola* Fallkn and *Allognosta sapporensis* Matsumura and also as the secondary parasite of the pupa of *Apanteles ruficornis* Haliday which parasitizes *Naranga aures* Moore, *A. glomeratus* (L.) and *Microplitis medianus* Ruthe.

The following three species were previously recorded from Japan as species associated with the diamondback moth, but are not obtained by our present investigation.

ICHNEUMONIDAE

1. *Itoplectis narangae* (Ashmead)  
[Japanese name: Aomushi-hirata-himebachi]


CHALICIDIDAE

2. *Brachymeria excarinata* Gahan


BIOLOGICAL NOTES: Solitary endophagous primary parasitoid of pupae (Matsuura, 1977).

PTEROMALIDAE

3. *Dibrachys* sp.


BIOLOGICAL NOTES: Secondary parasitoid emerging from the parasitized prepupa of the diamondback moth (Yamada & Yamaguchi, 1985).

Acknowledgements

We are grateful to the late Dr. Y. Fujita and Dr. I. Yamanaka (Takarazuka Research Institute, Sumitomo Chemical Co. Ltd.) for valuable discussion and advice. We are also grateful to Prof. T.
Miura (Laboratory of Insect Management, Faculty of Agriculture, Shimane University) and Prof. K. Nohara (Applied Entomological Laboratory, Faculty of Agriculture, Kyushu Tokai University) for their support and cooperation. We thank Dr. K. Kamijo (Hokkaido Forest Experiment Station), Prof. T. Tachikawa (Entomological Laboratory, College of Agriculture, Ehime University) and Assoc. Prof. M. Hirose (Division of Insect Natural Enemies, Institute of Biological Control, Faculty of Agriculture, Kyushu University) for identification and useful suggestion; Prof. Yau-I Chu (Laboratory of Biological Control, Department of Plant Pathology and Entomology, National Taiwan University), Prof. M. Matsuura (Laboratory of Entomology, Faculty of Agriculture, Mie University), Dr. H. Yamada (Gifu Agricultural Experiment Station) and Dr. Y. Iwamoto (Oita Prefectural Agricultural Research Center) for useful suggestion and literature; and the following persons for their help to this work: Prof. A. Sakanoshita, Assoc. Prof. H. Uematsu, Mr. T. Yamashita (Laboratory of Applied Entomology, Faculty of Agriculture, Miyazaki University), Dr. K. Yamagishi (Laboratory of Applied Entomology & Nematology, Faculty of Agriculture, Meijo University), Messrs. K. Ishikawa, 0. Imoto, T. Higaki (Kyushu Tokai University), Dr. S. Naomi, Dr. T. Goto (now Forestry and Forest Products Research Institute, Tsukuba), Dr. N. Koda (now Biological Laboratory, Nanzan University), Dr. T. Hirowatari (now Entomological Laboratory, Faculty of Agriculture, University of Osaka Prefecture), Messrs. Y. Sawada, Y. Abe, M. Yoshida (now Laboratory of Nematology and Soil Zoology, National Institute of Agro-Environmental Sciences), S. Nomura, K. Yahiro and T. Yasunaga (Entomological Laboratory, Faculty of Agriculture, Kyushu University).

We thank Dr. Robert W. Carlson, USDA, Washington, D. C. for identification of the Ichneumonidae and reading the manuscript of this paper.

Finally but not least, we thank Sumitomo Chemical Co. Ltd. for financial support.

References


