オオヨコバイとその卵寄生蜂の生態(2)

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Ecological studies on the green leafhopper, *Tettigella viridis* LINNÉ and its egg parasitoids. 2. Species composition and seasonal occurrence of the parasitoids.

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Introduction

The host range of the green leafhopper, *Tettigella viridis* LINNÉ (Homoptera : Tettigellidae), is known to be rather broad, but the biology has not been well studied. Few reports on the interactions between *T. viridis* and its egg parasitoids have been presented[1,2,3]. Further, the egg parasitoids of *T. viridis* include the species attacking the green rice leafhopper, *Nephotettix cincticeps* Uhler, indicating a complex food chain among the species concerned.

A series of ecological studies on *T. viridis* and its egg parasitoids and their interactions was done. The ecology of *T. viridis* was reported earlier[4]. In the present paper, the results on species composition and seasonal occurrence of the egg parasitoids are reported. The ecology of *Gonatocerus cicadellae* NIKOLSKAYA (Hymenoptera : Mymaridae) will be published elsewhere except for its hibernation and seasonal occurrence[5].

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Materials and Methods

Field surveys were made in mulberry fields of Yamaguchi University Farm, Yamaguchi City, from January 1983 to September 1984. In addition, egg masses of *T. viridis* oviposited on mulberry (*Morus bombycis*), rush (*Juncus* sp.), barnyardgrass (*Echinochloa Crus-galli*) and Italian ryegrass (*Lolium multiflorum*) were collected on the farm and reared to find egg parasitoids.

1. Species composition

Eggs of *T. viridis* collected for the various purposes of the present study were reared and parasitoids emerging were examined to determine their species composition.

2. Seasonal occurrence

One hundred sweepings by insect net (diameter : 42 cm) were made every ten days in the mulberry fields (100 m^2) between April 11, 1983 and December 20, 1983 and between January 12, 1984 and September 10, 1984. The sweepings covered mulberry trees and undergrowth. The number of adult egg parasitoids collected by these sweepings was counted.

Additional data were obtained by the following study. From June 23, 1983 to September 4, one hundred stems of *Lolium multiflorum* (until August 3) and *Echinochloa Crus-galli* (after August 4) were collected at random at intervals of ten days (a total of eight times during the period), and egg masses oviposited were taken out for rearing. Parasitoids emerging from this rearing were examined.

3. Hibernation

Fifteen egg masses oviposited on mulberry were collected at random on each of March 28, April 6, 11, 15, 18 and 21 in 1984 (total, six times), and were reared in the laboratory to determine the parasitization and percentage of emergence. In the winters of 1983 and 1984, egg masses oviposited on mulberry and *Juncus* sp. were collected at random to learn the percentage of parasitism.

Results and Discussion

1. Species composition

The egg parasitoids of *T. viridis* previously known from Japan are : *Anagrus flaveolus* WATERHOUSE, *Gonatocerus cicadellae* NIKOLSKAYA *and Ooctonus orientalis*

DOUTT of Mymaridae and *Oligosita krygeri* GIRAULT of Trichogrammatidae. Through the present study, six species belonging to two families emerged from the eggs of *T. viridis* : *Gonatocerus cicadellae* NIKOLSKAYA, *Anagrus* sp. A and *Anagrus* sp. B of Mymaridae ; *Oligosita krygeri* GIRAULT, *Oligosita* sp. and *Paracentrobia andoi* (ISHII) of Trichogrammatidae.

Anagrus spp. (A and B) found in this study are different from *A. flaveolus* WATERHOUSE. Thus, *Anagrus* spp. (A and B), *Oligosita* sp. and *Paracentrobia andoi* were found from *T. viridis* for the first time in Japan.

It was found that *Anagrus* spp. (A and B) showed multiple parasitism and two or three eggs were oviposited in one host egg. Other species showed solitary parasitism.

2. Seasonal occurrence

The seasonal occurrence of *G. cicadellae* and *O. krygeri*, the two dominant species among those studied, is described here and shown in Fig. 1 together with the seasonal occurrence of adult *T. viridis* for comparison.

1) 1983

Adult *G. cicadellae* was found from early June to late October, and two peaks were recognized on July 10 and August 20. As *Setaria* species are abundant during this period, June to October, *T. viridis* populations attacking *Setaria*[4] may affect the occurrence described above.

O. krygeri was less abundant than *G. cicadellae*, but was collected for a longer period, from May 30 to November 22. Thus, *O. krygeri* was present longer than *G. cicadellae*, appearing till late autumn. As some adult *O. krygeri* lived more than 30 days when fed honey at 25℃ under 14L-10D, the seasonal occurrence described above may be due to their longer longevity.

2) 1984

The same two species were collected after May 22, though the sweepings were started from January 12. Rather many adult *G. cicadellae* were collected on June 11, July 4, July 20 and September 10. *O. krygeri* was less abundant than *G. cicadellae*, as in 1983, but two peaks were recognized on June 11 and July 20.

Judging from the seasonal occurrence described above, *G. cicadellae* seems to be rather active in the high temperature of summer, while *O. krygeri* is active for a longer period and till the lower temperatures of autumn. Fewer numbers of both species were collected in 1984 than in 1983 though the sweepings in 1984 ended in September. This

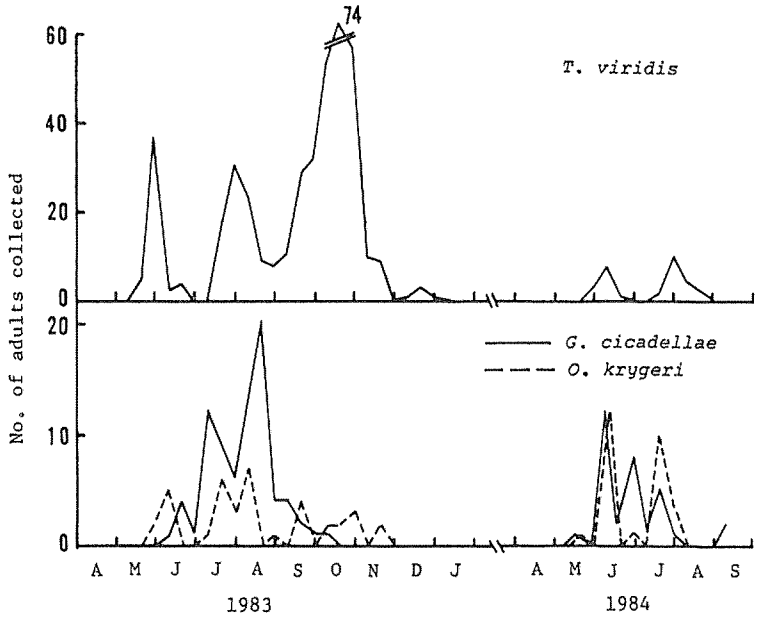

Fig. 1. Seasonal occurrence of *Tettigella viridis*, *Gonatocerus cicadellae* and *Oligosita krygeri* in the mulberry fields of Yamaguchi University Farm (*T. viridis* data from MIURA[4]).

tendency is similar to that of *T. viridis* as seen in Fig. 1.

ARZONE[1)2)]stated that these two species have two generations a year in Italy. From the present data, however, it is not possible to know how many generations of these species occur in the Yamaguchi area.

3. Hibernation

It was found through the winter surveys made in 1983 and 1984 that overwintering *T. viridis* eggs were parasitized by *Anagrus* spp., *G. cicadellae* and *O. krygeri*.

1) *Anagrus* spp.

A total of 1266 eggs of *T. viridis* were collected by occasional collections from the end of February to April 17, 1983. The percentage of parasitism per egg was 16.4% in 1983, while it was 6.5% for 982 eggs collected from March 28 to April 21, 1984.

Developmental stages of *Anagrus* spp. in host eggs after hibernation was studied and the result is shown in Table 1. The host eggs for this study were obtained by six collections made from March 28 to April 21, 1984. All specimens of *Anagrus* spp. were

Table 1. Percentage of developmental stages of *Anagrus* spp. in *Tettigella viridis* eggs after hibernation (Yamaguchi City, 1984).

Date of collection and dissection of host eggs	No. of host eggs dissected	No. of host eggs parasitized	Developmental stages of *Anagrus* spp. (%)			
			larva	pre-pupa	pupa	host egg with emergence hole
March 28	191	15	100.0	0.0	0.0	0.0
April 6	165	19	15.8	26.3	57.9	0.0
April 11	146	32	46.9	0.0	53.1	0.0
April 15	144	6	16.7	83.3	0.0	0.0
April 18	165	14	0.0	0.0	64.3	35.7
April 21	130	6	0.0	0.0	0.0	100.0
Total	941	92				

in the larval stage on March 28, and 53.1% and 57.9% were in the pupal stage on April 6 and 11, respectively. On April 18, 64.3% were in pupal stage, 0% in larval stage and 35.7% were empty host eggs after the adult had emerged. On April 21, no larvae were found and all host eggs were empty following adult emergence. On April 15, 16.7% were in the larval stage, 83.3% in prepupal stage, and no pupa or adult emergence was found.

According to this result, *Anagrus* spp. seemed to emerge in 1984 after the middle of April when the almost simultaneous hatching of *T. viridis* eggs. Since there were no eggs of *T. viridis* for about two months thereafter and *Anagrus* spp. rarely attack *T. viridis* except in winter, the former species seem to attack *T. viridis* eggs only for their hibernation.

2) *G. cicadellae* and *O. krygeri*

The percentage of parasitism per egg of *G. cicadellae* in *T. viridis* eggs studied for *Anagrus* spp. mentioned above was 2.4% in 1983 and 4.7% in 1984. The percentage of *O. krygeri* was 0.3% in 1983 and 9.3% in 1984.

Judging from the result on the present parasitoid species, overwintering *T. viridis* eggs were primarily parasitized by *Anagrus* spp. and to a less extent by *G. cicadellae* and *O. krygeri*. These phenomena of overwintering in the latter two species seem to differ from those observed by ARZONE[1,2] in Italy. In the fields where ARZONE observed, these species seem to parasitize *T. viridis* eggs as a usual overwintering host.

KAWASE and ISHIZAKI[3] reported on the biology of the egg parasitoids of *T. viridis*. Their data, however, are not discussed here since no species and scientific names were given in their paper.

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オオヨコバイとその卵寄生蜂の生態
2．卵寄生蜂の種類組成と季節消長

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要旨

Tettigella viridis LINNÉオオヨコバイとその卵寄生蜂群の両者の動態並びに相互関係を明らかにする研究の一環として，オオヨコバイの卵寄生蜂の種類組成と季節消長を調査した。1983年1月から1984年9月までの期間，山口市の山口大学農学部附属農場のクワ畑で，クワと下草を対象に定期定量すくい取りを実施したほか，クワ，イグサ，イタリアンライグラスとイヌビエに産付されていたオオヨコバイの卵塊を採集し，次の結果を得た。

1．調査したオオヨコバイの卵から羽化した卵寄生蜂は次の2科6種であった。

Mymaridae ホソハネヤドリコバチ科

Gonatocerus cicadellae NIKOLSKAYA, *Anagrus* sp. A, *Anagrus* sp. B

Trichogrammatidae タマゴヤドリコバチ科

Oligosita krygeri GIRAULT, *Oligosita* sp., *Paracentrobia andoi* (ISHII) トビイロウンカタマゴバチ

このうち，*G. cicadellae*と*O. krygeri*以外の種はオオヨコバイの卵寄生蜂としては日本から初めて記録された。これら6種のうち，*G. cicadellae*と*O. krygeri*の2種が優占種であった。また，*Anagrus* spp. (A, B) は共寄生であったが，その他の種は単寄生であった。

2．*G. cicadellae*と*O. krygeri*の成虫の季節消長は異なり，*O. krygeri*の方が長期間にわたり出現し，11月下旬まで見出された。*G. cicadellae*は夏期に発生が多い傾向がみられた。

3．オオヨコバイの越冬卵を調査した結果，*G. cicadellae, O. krygeri*と*Anagrus* spp. (A, B) が寄生していたが，前2種は少なく，主に*Anagrus* spp. (A, B) が寄生することが判明した。これは*G. cicadellae*と*O. krygeri*も通常オオヨコバイ卵で越冬するイタリーでの例と異なる。