การใช้หลักการบริหารสัตว์ป่าสำหรับเมลงสัตว์อ่อย : สัตว์ธรรมชาติ-
ของชนเผ่าเล็กน้อย และยอดอ่อยในประเทศไทย

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การใช้หลักการบริหารศัตรูพืชสำหรับแมลงศัตรูอ้อย:

ศัตรูธรรมชาติของหนอนเจาะลำต้นและยอดอ้อยในประเทศไทย

Sugarcane insect pest management:

Natural enemy complex of sugarcane moth borers

in Thailand

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การศึกษาเกี่ยวกับแมลงศัตรูธรรมชาติของหนอนเจาะลำต้นและยอดอ้อย Chilo infascatellus, Chilo sacchariphagus , Scirpophaga excerptalis และ Sesamia inferens ได้ทำการสำรวจและศึกษาทั้งในสภาพไร่และภายในห้องทดลอง โดยได้ทำการสำรวจในหลายพื้นที่ที่มีการปลูกอ้อยในประเทศไทย จากการสำรวจและศึกษาพบว่า แตนเบียนไข่ Trichogramma chilotraeae, Teleromus rowani และแตนเบียนหนอน Cotesia flavipes เป็นแมลงศัตรูธรรมชาติที่สำคัญที่สุดที่พบว่ามีความสำคัญรองลงมาคือ แตนเบียน Temelucha philippinensis , Xanthopimpla sp. และ Tetrastichus schoenobii นอกจากนั้นยังพบแมลงวันก้นขน แมลงหางหนีบ และแมงมุม เป็นศัตรูธรรมชาติของหนอนเจาะลำต้นและยอดอ้อย ศัตรูธรรมชาติเหล่านี้นับว่ามีบทบาทมากในการควบคุมประชากรของหนอนเจาะลำต้นและยอดอ้อย

Investigation on natural enemies of sugarcane moth borers, Chilo infuscatellus Snellen, Chilo sacchariphagus (Bojer), Scirpophaga excerptalis (Walker) and Sessamia inferens (Walker) were carried out in the laboratory and supplemented with investigation under field condition in several sugarcane growing areas in Thailand. The investigation revealed that Trichogramma chilotraeae Nagaria & Nagarkatti, Telenomus rowani (Gahan) and Cotesia flavipes (Cameron) were the most important parasites of these sugarcane moth borers. Other less important natural enemies were the hymenopterous parasites, Temelucha philippinensis (Ashmead) Xanthopimpla sp. , Tetrastichus schoenobii (Ferriere) a species of unidentified tachinid, few species of earwigs and some species of spiders. These natural enemies were important factors regulating the population of sugarcane moth borers.

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[1]ผลงานที่เสนอในการประชุมนักวิชาการอ้อยและน้ำตาลระหว่างประเทศ ระหว่างวันที่ 9-14 มีนาคม 2533 กรุงเทพ , ประเทศไทย

INTRODUCTION

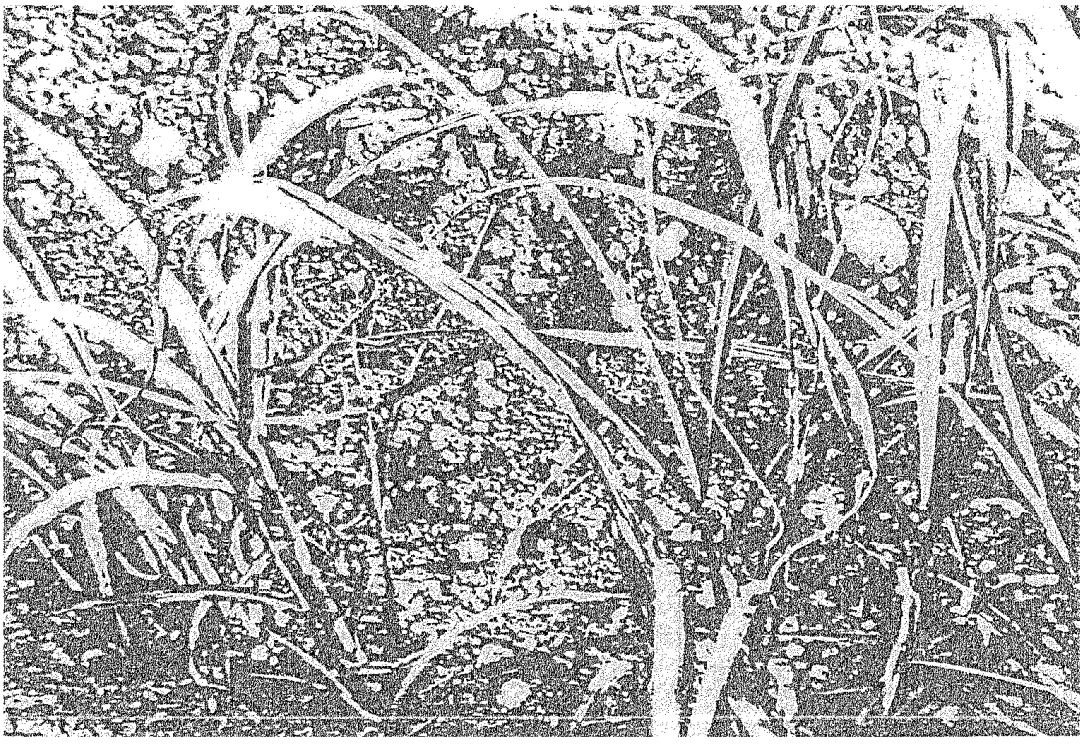
The sugarcane moth borers complex is considered the most important insect pest of sugarcane in Thailand. The species of moth borers are Chilo infuscatellus Snellen, Chilo sacchariphagus (Bojer) Sesamia inferens (Walker) and Scirpophaga excerptalis (Walker). The species complex of these moth borers vary in various sugarcane growing areas and the infestation occurs all over the year (Suasa-ard,1982). An infestation by moth borers results in the characteristic "dead heart" in the young cane and "bunchy top" in the older cane (Fig. 1) with subsequent reduction in crop stands in the young shoot stage and reduction in stalk weight and juice quality at harvest.

Since the results of chemical control of sugarcane moth borers in the field have been often disappointing and not cost-effective,research into the potential value of their natural enemies becomes evidently important as a basis fundamental to the sugarcane borer management program. The objective of this study is to evaluate the natural enemy complex of sugarcane moth borers with a prospects of utilizing these natural enemies as biological control agents of sugarcane moth borers in Thailand.

MATERIALS AND METHODS

Survey and evaluation of natural enemies

Field survey and evaluation of natural enemies of sugarcane moth borers were carried out in major sugarcane growing areas in Thailand. Kampaeng Saen, Nakhon Pathom was the main site for this investigation. The extensive field survey and evaluation were done by collecting and examining all predators found attacking sugarcane moth borers and collecting all immature stages of sugarcane moth borers for parasite emergence, examination and identification. The more important parasite species were reared and used for further biological study and evaluation.



Figuer 1 A characteristic "dead heart" caused by sugarcane moth borer in young sugarcane.

Sampling for the population of natural enemies of sugarcane moth borers were set at Kampaeng Saen, Nakhon Pathom. One stool was used as a sample and 100 samples were taken from the area of 1 ha. The sampling was carried out at two-week intervals from the time of the emergence of sugarcane through the cropping period of one year. The number of natural enemies and all stage of sugarcane moth borers were recorded for further evaluation.

Evaluation of the natural enemies

The evaluation of natural enemies was carried out at Kampaeng Saen, Nakhon Pathom by using the number of parasitized eggs and larvae as criteria for evaluation. The total number of eggs, and larvae and those parasitized were recorded at biweekly intervals during the period of investigation. The data obtained were later analyzed.

RESULTS AND DISCUSSION

Survey and evaluation of natural enemies

The field survey of natural enemies of sugarcane moth borers revealed 7 species of hymenopterous parasites, a species of dipterous parasite, a few species of earwigs, and a few species of spiders. Among the hymenopterous parasites, Telenomus rowani (Gaham) (Hymenoptera : Scelionidae), Trichogramma chilotraeae Nagaraja and Nagarkatti (Hymenptera : Trichogrammatidae) were egg parasites; Cotesia flavipes (Cameron) (Hymenopter: Braconidae), an unidentified braconid in Subfamily Doryctinae and Temelucha philippinensis (Ashmead) (Hymenoptera : Ichneumonidae) were larval parasites; and Tetrastichus ayyari Rohwer (Hymenoptera : Eulophidae) and Xanthopimpla stemmator (Thunberg) (Hymenoptera : Ichneumonidae) were pupal parasites. Agarwal and Siddique (1964) and Moutia and Courtois (1952) reported that T. chilotreae, C. flavipes and T. ayyari were the most important parasites of sugarcane borers in India, Pakistan and Mauritius.

From the field evaluation in this study it was evident that T. rowani, T. chilotraeae, C. flavipes and T. ayyari were the most dominant species of parasites of sugarcane moth borers. The population of T. chilotraeae, T. rowani and C. flavipes appeared at relatively high levels from June to December. The pattern of population fluctuation is shown in Fig. 2. Other species of natural enemies, however, occurred at low densities during the same period.

Biological study of some parasites

Trichogramma chilotraeae Nagaraja & Nagarkatti

T. chilotraeae was an important egg parasite of C. infuscatellus and C. sacchariphagus. The adult of T. chilotraeae was pale yellow. The average length from head to the tip of abdomen was 0.42 ± 0.04 mm. The wing expanse was 1.31 ± 0.05 mm (Fig. 3). Sex differentiation could be detected by the antennae. The male antenna was plumose while the female antenna was geniculate.

The preoviposition period of T. chilotraeae was less than 24 h after adult emergence. The larval period was about 4 to 6 days and the pupal period was about 4 to 5 days. The total life cycle from egg to adult emergence was about 9 to 13 days. The longevity of adult was about 2 to 5 days.

Telenomus rowani (Gahan)

T. rowani was an egg parasite of C. infuscatellus, C. sacchariphagus and S. excerptalis. Head and thorax of adults were shining black. The length from head to abdomen was 0.87 ± 0.13 mm (Fig. 4).

The adult T. rowani was positively phototaxis and fed immediately after emergence and soon started to mate. The oviposition occurred few hours after emergence. The total life cycle from egg to adult emergence was about 8 to 12 days. The longevity of adult was about 2 to 6 days.

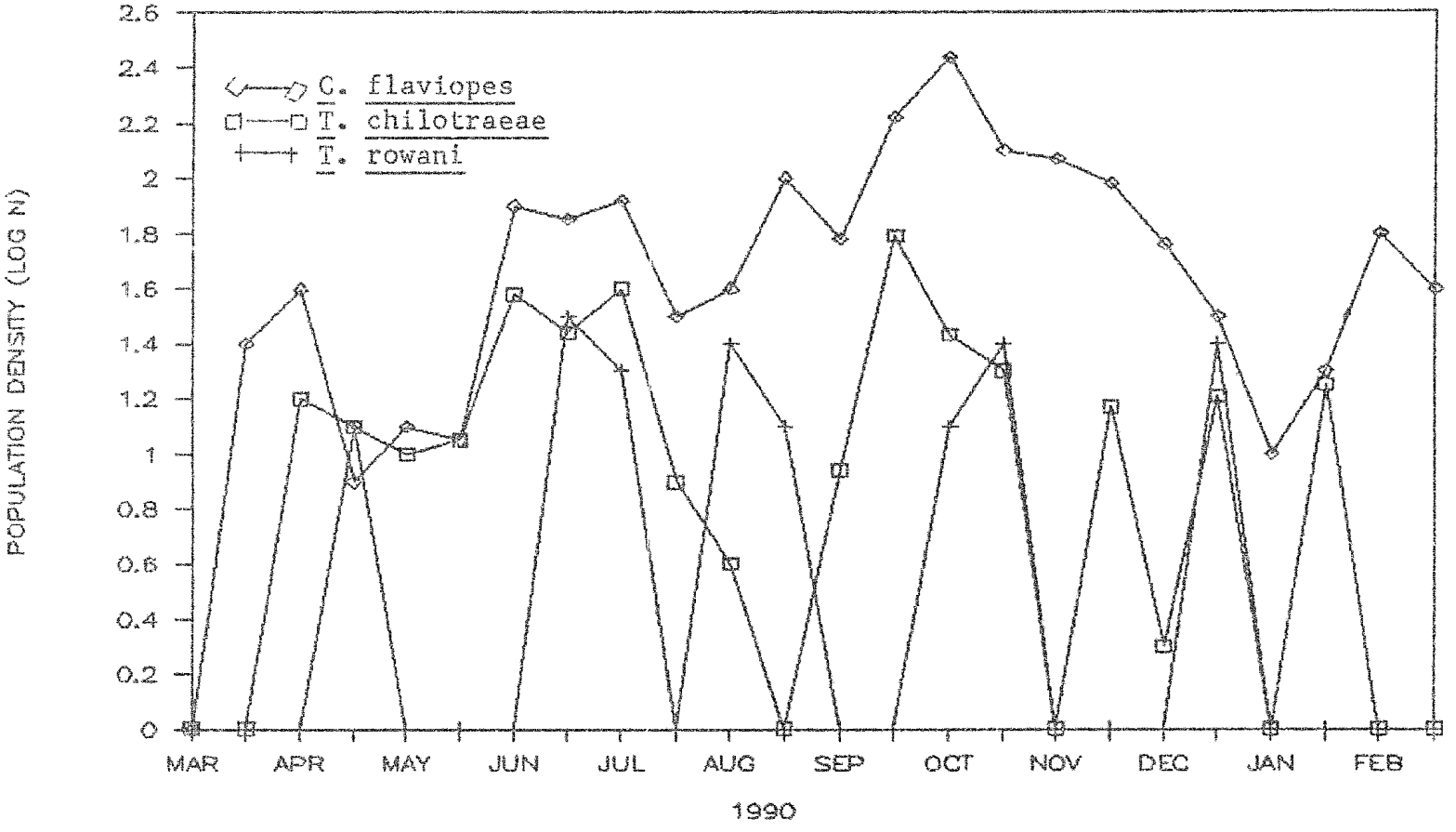


Fig. 2. Population density of Cotesia flavipes (Cameron), Trichogramma chilotraeae Nagaraja & Nagaketti and Telenomus rowani (Gahan) at Kampaeng Saen, Nakhon Pathom, Thailand in 1990.

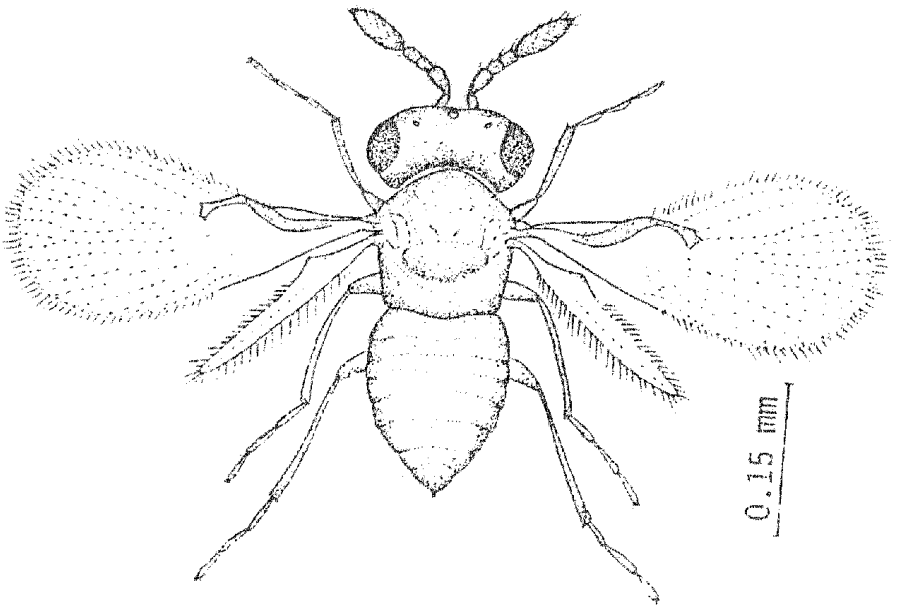


Fig. 3. Female adult of Trichogramma chilotraeae Nagaraja & Nagaketti.

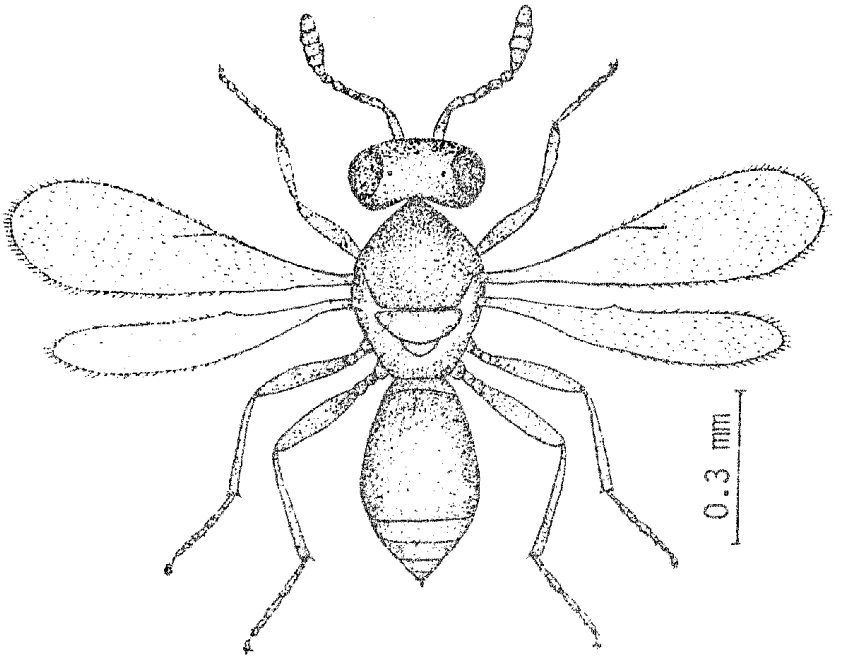


Fig. 4. Female adults of Telenomus rowani (Gahan).

Cotesia flavipes (Cameron)

C. flavipes was an important internal larval parasite of sugarcane moth borers. The egg of C. flavipes was creamy white and became pale-yellow before hatching. The larvae of C. flavipes was vermiform, white to pale yellow in color. The mature larva of C. flavipes began to spin cocoon immediately for pupation after coming out from the host larva. The number of pupae obtained per parasitized larva was 82.63 ± 24.24. The cocoon was stoutly constructed, white in color and measured 2.23 ± 0.13 mm (Fig. 5). The thorax and abdomen of adult C. flavipes were black while the legs, antennae and mouthparts were light reddish brown (Fig. 5). The female antennae were submoniliform, short, not as long as body but the male antannae were filiform. The average length from head to the tip of abdomen was 1.83 ± 0.06 mm. The wing expanse was 3.14 ± 0.12 mm. The adult parasite laid eggs inside the host larvae and the incubation period was about 1 to 2 days. The duration of development from egg to prepupa was 12.76 ± 0.79 days. The pupal stage took 5.70 ± 0.88 days. The total life cycle from egg to adult emergence was 20.10 ± 1.17 days under laboratory condition.

The investigation revealed that female adults of C. flavipes could parasitized larvae of sugarcane moth borers in all stages of development especially the third to fourth instar larvae.

Assessment and evaluation of parasites of sugarcane moth borers

The evaluation revealed that T. chilotraeae and T. rowani were the most important egg parasites of C. infuscatellus, C. sacchariphagus and C. excerptalis. The number of parasitized eggs increased as the number of egg increased, as illustrated in Fig. 6. The overall percent parasitization by T. chilotraeae and T. rowani over the year were 34.3 and 16.12 respectively.

C. flavipes was considered as the most important larval parasite of C. infuscatellus, C. sacchariphagus and S. inferens. C. flavipes could

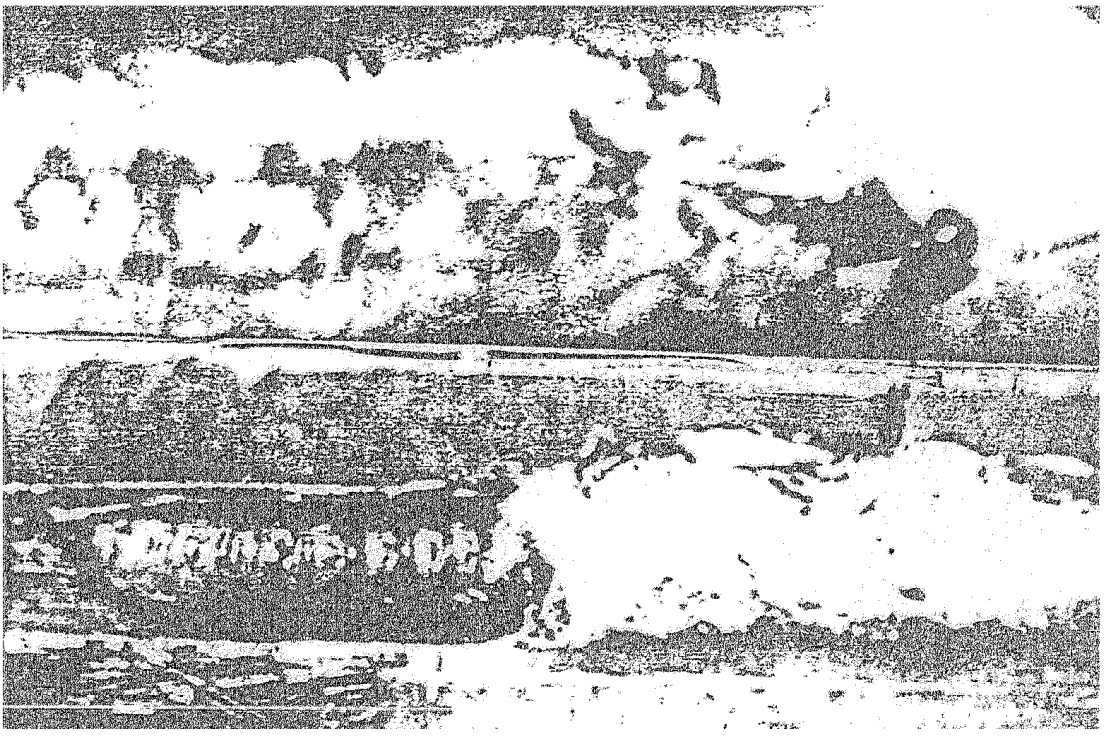


Figure 5. A female adult of Cotesia flavipes (Cameron) and the mass of cocoons of C. flavipes around the parasitized larva of sugarcane moth borer.

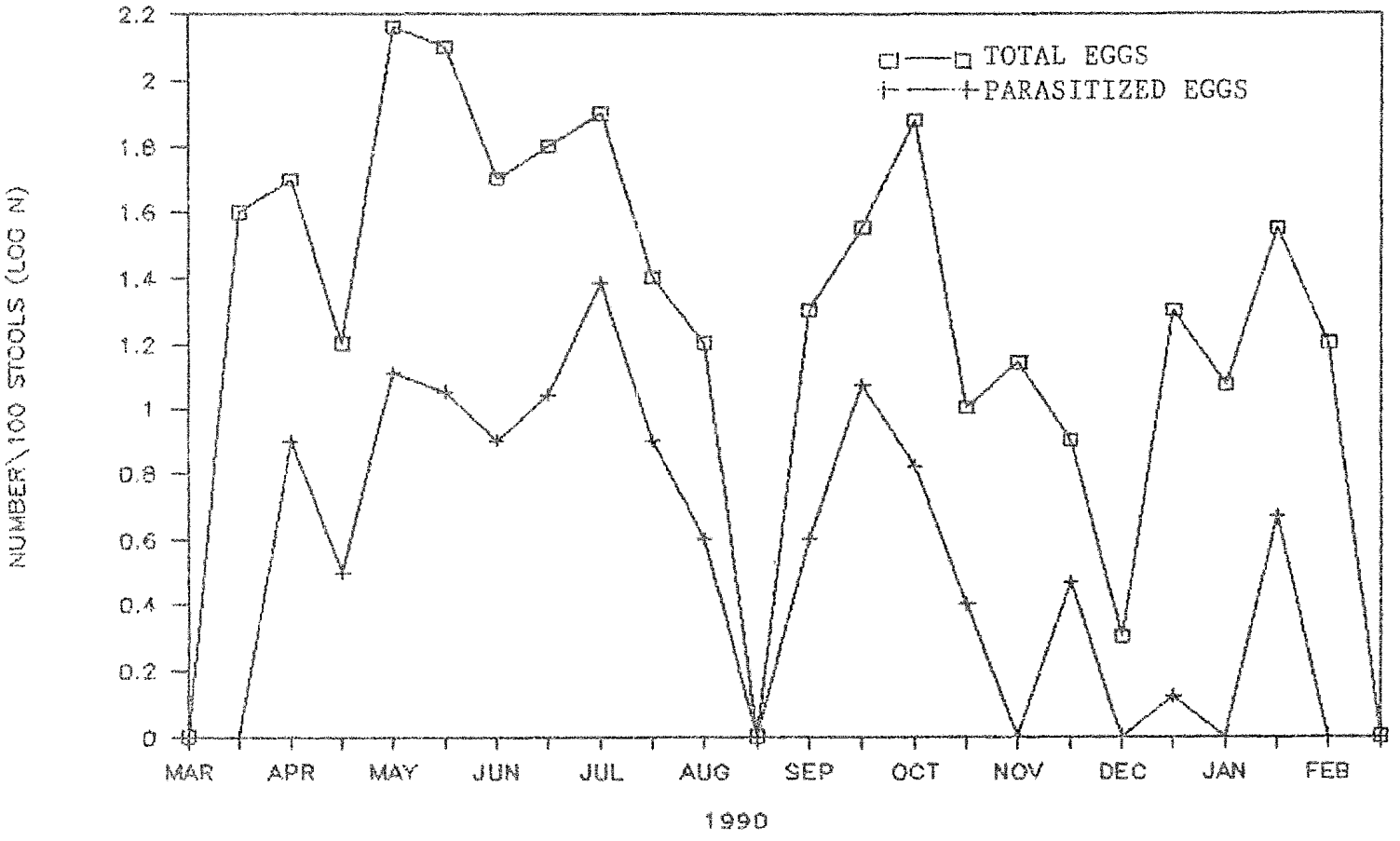


Fig. 6. Relationship between the total eggs of Chilo infuscatellus Snellen, Chilo saccharipagus (Bojer) and Scirpophega exerptalis (Walker) and the parasitized eggs by Trichogramma chilotraeae Nagaraja & Nagarketti and Telenomus rowani (gahan) at Kampaeng Saen, Nakhon Pathom, Thailand.

parasitize all stages of larvae of these sugarcane moth borers. The relationships between the total number of larvae of these sugarcane moth borers and the number of parasitized larvae were shown in Fig. 7. It was apparent that the number of parasitized larvae increased as the total number of larvae increased. The percent parasitization by A. flavipes over thr year was 23.49. The highest parasitization occurred in October and was about 32.81 percent.

This investigation indicated that T. chilotraeae , T. rowani , and C. flavipes were the most important biological control agents of sugarcane moth borers. The data obtained from this study could be utilized for further work on the utilization of these parasites in the augmentative biological control of sugarcane moth borers in Thailand.

CONCLUSION

The investigation on natural enemies of sugarcane moth borers, Chilo infuscatellus, Chilo sacchariphagus (Bojer), Sesamia inferens (Walker) and Scirphophaga exerptalis (Walker) revealed that seven species of hymenopterous parasites, a species of dipterous parasite, a few species of earwigs, and spiders were important natural enemies of these sugarcane moth borers. Among of these, Trichogramma chilotraeae Nagaraja & Nagarkatti, Telenomus rowani (Gahan) and Cotesia flavipes (Cameron) were the most important egg and larval parasites of sugarcane moth borers in Thailand.

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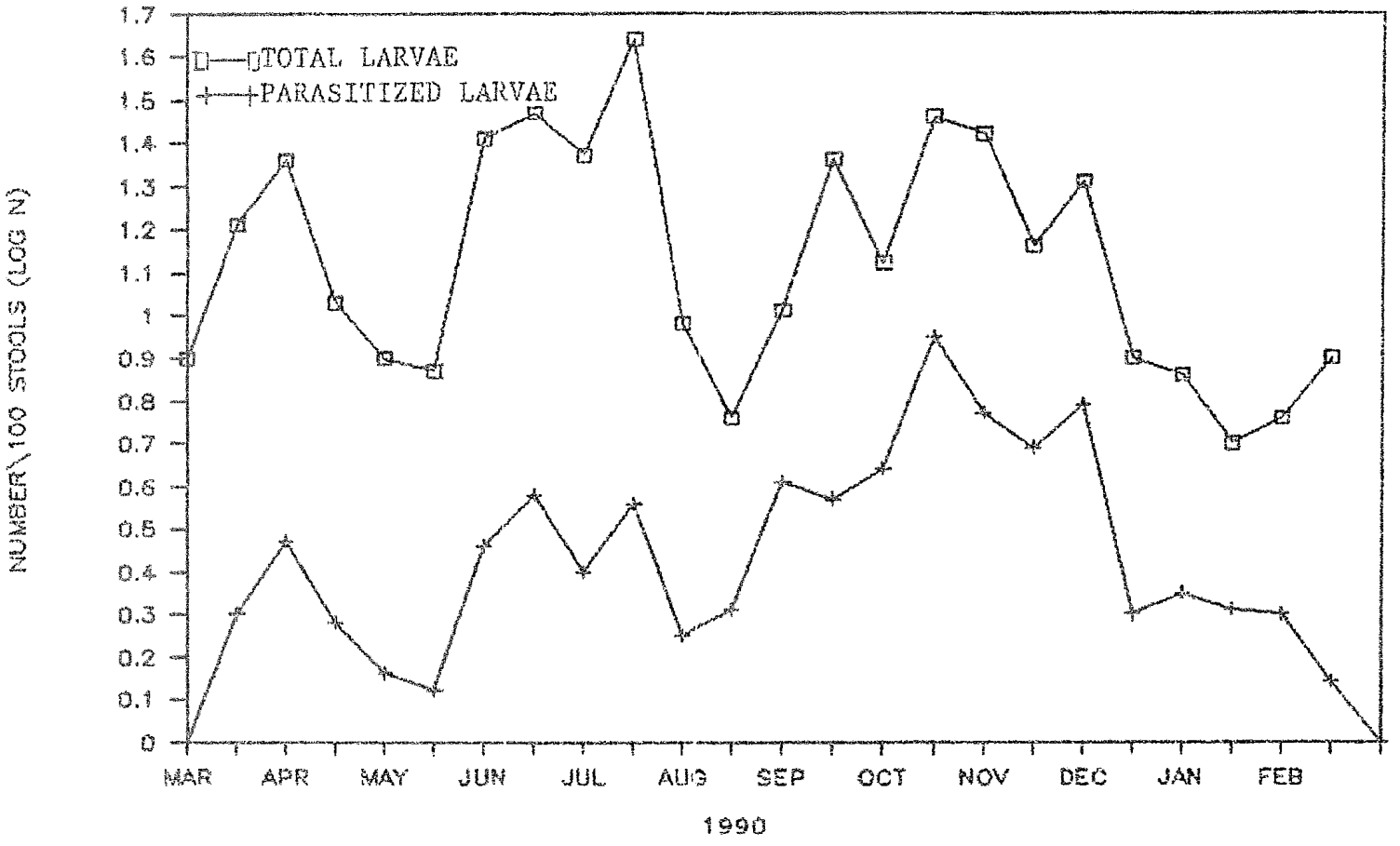

Fig. 7. Relationship between the total larvae of Chilo infuscatellus Snellen, Chilo sacchariphagus (Bojer) and Sesamia inferens (Walker) and the parasitized larvae by Cotesia flavipes (Cameron) at Kampaeng Saen, Nakhon Pathom, Thailand in 1990.