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Further Observations on Parasitism of Two Egg Parasites of the Rice

Stem Borer, *Trichogramma*

japonicum ASHMEAD and

Telenomus dignus (GAHAN)¹

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The relation of the number of parasitized eggs to the total eggs in an egg mass of the rice stem borer, *Chilo suppressalis* WALKER, has already been clarified by the writer in a paddy field at Nogi, Matsue City in June, 1954 (ÔTAKE, 1955). The number of eggs parasitized by *Trichogramma japonicum* ASHMEAD in an egg mass seldom exceeded over 30, while that by *Telenomus dignus* (GAHAN)² tended to increase with the size of the egg mass as

indicated by the total number of eggs forming the mass, which varied remarkably even in the same size of the mass.

During the succeeding three years, the writer made further observations on this theme and confirmed the same relation in principle.

Eggs of the borer in its first brood occur from late spring to early summer in the Matsue district. During that period in 1955, 1956 and 1957, egg masses were repeatedly gathered from both nursery beds and paddy fields at Nogi, their color being recorded at the time of discovery. In these masses were included ones found just after hatching. As already stated by the writer (1959), an egg mass of the borer changes its color corresponding to the embryonic development of eggs forming the mass: it is pale at the time of oviposition and then becomes brownish yellow or grey, turning blackish at last. It is after the embryonic revolution, or

¹ ズイムシアカタマゴバチとズイムシクロタマゴバチの寄生様式についての観察続報 大竹昭郎 島根農科大学応用昆虫学研究室

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² According to YASUMATSU (1950), *Telenomus* attacking the rice stem borer in Japan is not *beneficiens* but *dignus*.

after 55 to 60 per cent of the whole egg period has elapsed (GOTOH, 1954) that the last color settles. Egg masses with the last color (dark brown or brownish black) may be regarded as having only scant possibility of suffering from egg parasites, considering that the per cent parasitism of eggs is remarkably low when the eggs are prevented from being exposed of parasites until they attain about 60 per cent of the embryonic development in the case of *Tr. japonicum* (IYATOMI, 1943), and until the first one-third in the case of *Tel. dignus* (OKADA & MAKI, 1934). Especially in 1957 collected egg masses were restricted to ones with the last color and ones just after hatching; pale, grey and brown masses were not gathered even if they were discovered.

In the laboratory, the egg masses were kept separately in glass tubes until the completion of hatch, or until the emergence of parasites if parasitized. The masses were then preserved in 70 per cent alcohol. Each of them was later dipped in about 10 per cent KOH to dissolve its transparent cover and then egg chorions and dead eggs forming it were disconnected one after another, being divided into the following three groups under a binocular microscope: 1) not parasitized (chorions left after hatching and eggs which died before hatching); 2) parasitized by *Tr. japonicum*; and 3) parasitized by *Tel. dignus*. (There was no record, in the writer's observations, that both *Trichogramma* and *Telenomus* emerged from a single host egg.) The number of eggs in these three groups was counted respectively. (For particulars, see ÔTAKE (1959)).

The results obtained during the three years are summarized in Fig. 1. As mentioned already, they well agree with those in 1954 except for following two points:

1) In early July, 1956, the number of eggs parasitized by *Tr. japonicum* in an egg mass was frequently far over 30 and

multiparasitism was remarkable. It should be noticed in this connection that all egg masses collected at that time were parasitized by the parasite. We can therefore assume that towards the end of the first emergence period of the moths in that year, when the egg masses accordingly decreased in number, the adults of *Tr. japonicum* would be increasingly more abundant as its generations went by, and that this would result in repeated attacks of a particular egg mass by more than one adult parasite. (Dr. R. L. EDWARDS, in his communication to the writer, assumes through his experience in other species of *Trichogramma* that 30 would be about the maximum egg-laying potential of a single female of trichogrammids, and suggests that a possible explanation of the writer's observation on *Tr. japonicum* made in 1954 could be that generally a particular egg mass is never found by more than one female and that in it she deposits her entire supply of eggs.) Such a high parasitism of egg masses by *Tr. japonicum* at the end of the emergence period of the moths in its first brood was often observed in other places of the Matsue district (ÔTAKE, 1956).

2) In the egg masses parasitized by *Tel. dignus*, which were collected in 1957, the ratio of the number of parasitized eggs to the total of eggs forming the mass was conspicuously high in general. In that year, the parasite showed considerably high parasitism from the end of June to the beginning of July (ÔTAKE, unpublished data), though in other years the parasite is active from the end of May to the middle of June and then becomes rare regardless of the existence of the hosts. In other words, the peak of the activity of *Tel. dignus* in 1957 was delayed considerably and came at the end of the occurrence period of the hosts. It may therefore be allowed to bring here again the assumption mentioned in the preceding paragraph.

According to the observation made in laboratory by OKADA & MAKI (1934), a

Fig. 1. The relation between the number of parasitized eggs and the total eggs in an egg mass of *Chilo suppressalis* in its first brood. The whole parasitized egg masses collected at Nogi, Matsue City in 1955, 1956 and 1957 are shown. A: Both (×) and (⊗) represent an egg mass parasitized by *Trichogramma japonicum* alone, the latter being collected early in July, 1956; ×—■, by both *Tr. japonicum* and *Telenomus dignus*, × representing the number of eggs parasitized by *Tr. japonicum* and ■ by *Tel. dignus*. B: The egg masses parasitized by *Tel. dignus* alone; × represents an egg mass whose color was white or pale yellow; △, yellowish brown, orange, grey or brown; ● or ○, dark brown or brownish black, or just after hatching, a hollow circle being gathered in 1957 (in that year, masses with pale or light brownish color were not collected).

female of *Tel. dignus* deposited 143.7 eggs during 15.8 days of her life span (the average of 30 individuals). This egg-laying potential, however, will not always exhibited fully in the field, and it may be rather proper to assume that high parasitism often seen in larger masses is attained due to attacks by several parasites upon a single mass; sometimes, even when the host egg masses were found abundantly in the field, the writer observed masses on which two or three *Telenomus* females were depositing their eggs simultaneously.

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