INTRASPECIES COMPETITION IN A FIELD POPULATION OF *GREGOPIMPLA HIMALAYENSIS* (HYMENOPTERA: ICHNEUMONIDAE) PARASITIC ON *MALACOSOMA NEUSTRIA TESTACEA* (LEPIDOPTERA: LASIOCAMPIDAE)¹

Masakazu SHIGA*, and Akinori NAKANISHI**

* Entomological Laboratory, Faculty of Agriculture, Kyushu University, Fukuoka, Japan
** Biological Laboratory, General Education Department, Kyushu University, Fukuoka, Japan

INTRODUCTION

There are many discussions concerning the role of intraspecies competition in the regulation of natural populations. Nicholson (1954, 1957) argued that animal populations are regulated by density-dependent factors, especially through intraspecies competition. Milne (1957a, b) discussed that only intraspecies competition can act as the perfectly density-dependent factor. However, he added that natural populations seldom attain to such high densities at which intraspecies competition itself acts to regulate the population density, and that under usual conditions, population density is held at a low level by density-independent and imperfectly density-dependent factors (Milne, 1962).

Many facts concerning intraspecies competition within insect populations were revealed mainly by studies on experimental populations, and relatively few studies have been made on field populations (see Klomp, 1964).

Since the larvae of hymenopterous parasites develop on or in a single host, the amount of food on which they can feed is entirely limited. Even though the host condition is unsuitable, the parasite larvae cannot leave the host body, i.e. there is no dispersal. Therefore, when supernumeral eggs are deposited on a host by female parasites, a severe food shortage and hence the competition for food may occur among larvae.

As compared with solitary parasites, gregarious ones are lacking some characteristics by which severe competition can be avoided or mitigated.

1) Discrimination between parasitized and unparasitized hosts, even if it occurs, is not so effective for avoidance of competition (Salt, 1961).

2) Physical attack of the first instar larvae is not found (Salt, 1961).

These facts suggest that intraspecies competition might be important in population dynamics of such species.

¹ Contribution Ser. 2, No. 275. Entomological Laboratory, Faculty of Agriculture, Kyushu University.
² Present address: Horticultural Research Station, Hiratsuka, Kanagawa-Pref., Japan.
External parasites have following superiorities for studies on the competition.
1) We can readily trace the number of individuals from egg to adult.
2) We can readily conduct some experimental treatments such as addition or removal of eggs or larvae on a host.

Considering these advantages, we have intended to clarify some phenomena concerning the intraspecies competition in a field population of a gregarious external parasite, *G. himalayensis*.

**MATERIALS AND METHODS**

A considerable percentage of parasitism by *G. himalayensis* on the prepupae of *Malacosoma neustria testacea* is usually observed from early to mid May near Fukuoka City.

Samples were collected from a row of cherry trees in the campus of General Education Department, Kyushu University at Ropponmatsu, Fukuoka City in 1964 (preliminary survey by A. NAKANISHI), 1966, and 1967. *M. neustria testacea* is a univoltine species. It makes cocoons and pupates from early to mid May on walls of buildings, fences, etc. The hosts are attacked by the parasites during their prepupal period. The adults of *G. himalayensis* insert the ovipositor through the cocoon, paralyze the host, and deposit several eggs on the surface of the host body. Paralyzed hosts stop the development and cannot pupate. Since the prepupae cease feeding and excretion, it is easy to evaluate the amount of food consumed by the parasite.

Duration of development of the parasite under the laboratory condition in May to June is as follows: egg period is 2-3 days; after 5 days of hatching, larvae cease feeding and make cocoons, and they develop into prepupae after another one day. Prepupal period lasts for 4 days; pupal period 7-8 days. Therefore, it takes 19-21 days to complete a life cycle. Diapause was not observed in any stage during this season.

On May 8-10, 1966, 222 host cocoons were collected and were brought into the laboratory. After opening the cocoon and examining the stage and the number of parasites, all hosts were weighed.

For 119 cocoons collected on May 10, the more intensive measurements were carried out as follows.

Dry weight of the host body was measured for a part of unparasitized hosts after drying at 110°C for 24 hrs. Then, a rectilinear relation between fresh weight and dry weight of hosts was found (Fig. 1).

\[
\text{Dry weight (g)} = 0.2741 \times \text{Fresh weight (g)} + 0.0011. \tag{1}
\]

Parasitized hosts were reared in petri dishes one by one under laboratory conditions. After the parasites made cocoons, host body was dried at 110°C for 24 hrs and weighed. This gives the the amount of food unconsumed by the parasites (*W*₁). Amount of consumed food, *Wₖ*, is given by

\[
Wₖ = W₀ - W₁, \tag{2}
\]