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Attack on the Parasitized Host by a
Primary Solitary Parasitoid, *Encarsia*
formosa (Hymenoptera: Aphelinini-
dae): the Second Female Pierces,
with Her Ovipositor, the Egg
Laid by the First One¹

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It has generally been believed that a solitary hymenopterous parasitoid never benefits from ovipositing in a parasitized host. The discriminating ability of parasitoids between parasitized and unparasitized hosts has also been regarded as an important attribute as a biological control agent (DOUTT and DEBACH, 1964; VAN LENTEREN, 1981). However, VAN ALPHEN and NELL (1982) noted that a parasitoid would actively deposit her eggs in or on the already parasitized host if her offspring might have a chance to survive. IKAWA and SUZUKI (1982) observed that a gregarious parasitoid, *Apanteles glomeratus* L., deposited her eggs in hosts already parasitized by a conspecific female owing neither to a mistake nor a lack of discriminating ability.

In my series of ecological studies on *Encarsia formosa* GAHAN, a larval primary solitary endoparasitoid of the greenhouse whitefly *Trialeurodes vaporariorum* (WESTWOOD), I had an opportunity to observe a female piercing with her ovipositor the egg previously deposited in the host by a conspecific female, antecedently to attacking the host. This

paper reports the result of further observation of this habit.

Before the experiment, unparasitized hosts were exposed to the wasps for an hour to obtain parasitized ones. To observe the ovipositional behavior of *E. formosa*, a new adult female was confined to a glass petri dish (1.5 cm high, 6 cm inside diameter) containing several parasitized hosts (early and middle 4th instars of the whitefly) which were glued to the underside of the lid (ARAKAWA, 1982). The body of the early and middle 4th instars is nearly transparent, and their ventral part has no wax, whereas the dorsal part is covered with white wax. So this method makes it easy to observe the inside of the host body, the movement of the parasitoid's ovipositor and the previously deposited whitish egg through the lid of the petri dish under a stereoscopic microscope.

Once *E. formosa* inserted her ovipositor in the host, she never failed to lay an egg except in the case of host-feeding; this occurs independent of oviposition (ARAKAWA, 1982). While she was inserting her ovipositor and inspecting the inside of the host, the ovipositor frequently touched the egg laid by the first female. Sometimes the ovipositor could not reach the egg because the distance between it and the point of insertion was longer than the length of her ovipositor. After her ovipositor touched the egg, she pierced the egg repeatedly, more than ten times in some cases (Fig. 1). Usually the egg was destroyed and the content spurted out into the host body. Thereafter, she deposited her own egg in the host. Although I could not confirm whether the previously deposited egg was dead, it may not have been able to live on because of persistent piercing.

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Fig. 1. A parasitized host attacked twice by *E. formosa* (view from ventral side of the host). The egg laid (black arrow) by the first female is being stung by the second one's ovipositor (white arrow).

UEMATSU (1981) and NELL and VAN LENTEREN (1982) observed that the adult female of an ecto-parasitoid deposited eggs after she had killed the pre-living conspecific immatures. The present example of *E. formosa* is the first case of an endo-parasitoid. The observation suggests that the female parasitoid does not always avoid ovipositing in or on a host already parasitized by a conspecific female and will oviposit rather actively if it means increasing the possibility for her offspring to survive.

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