Inspection and evaluation of host plant by the butterfly *Mechanitis lysimnia* (Nymph., Ithomiinae) before laying eggs: a mechanism to reduce intraspecific competition

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**Abstract.** Females of *Mechanitis lysimnia* (Lepidoptera: Nymphalidae) show a characteristic searching, inspecting and evaluating behavior on their *Solanum* host plants. The average egg-clutch size for this butterfly varied with the host species of *Solanum*. There was a positive relationship between the egg-clutch size of *M. lysimnia* and the number of leaves, indicating an adjustment between the reproductive effort of the insect and the amount of food available to its offspring. Field experiments showed that butterflies were able to recognize conspecific egg-clusters by visual cues and preferred to lay eggs on egg-free host plants. On large plants that received two or more egg-clusters, later clutches contained fewer eggs than the first one. The butterflies seem to evaluate the amount of food by inspecting the quantity of leaves and by checking for presence or absence of eggs and, possibly, caterpillars before deciding if and how many eggs to lay. These behavioral mechanisms should be important in reducing direct intraspecific competition for the five rare, small and ephemeral host plant species used by this insect.

**Key words:** Clutch size – Competition – Butterfly – Ithomiinae – Solanaceae

The diversity of reproductive strategies constitutes an interesting problem to be analyzed through ecological and evolutionary approaches. This diversity seems to be the result of several factors acted upon in different ways by natural selection in each population and species. Competition and predation (including parasitism) are important selective pressures in the evolution of strategies that optimize the utilization of available resources and the energy allocation for reproductive purpose.

The first studies on clutch size optimization were developed for birds (e.g. Moreau 1944; Lack 1947, 1948, 1949; Cody 1966; Ricklefs 1970; Foster 1974). For insect parasitoids Price (1974) presented the “balanced mortality hypothesis” where egg production is adapted to counter relative environmental harshness. Stamp (1980), Itô et al. (1982), Courtney (1984) and Vasconcellos-Neto (1980, 1991) discussed why some butterfly species cluster their eggs while others lay them singly.

The adjustment of clutch size is essential in situations where food resources are limited and when intraspecific competition is predicted to occur. According to Zimmerman (1982) egg recognition and deterrence of further oviposition among insects are expected in these cases. Females in many species avoid excessive oviposition in small habitat units by recognition of eggs contained in them (Utida 1943; Nakamura 1968; Ikemoto 1972; Kozlowski et al. 1983;MESSINA and Renwick 1985). This problem is apparently overcome in a number of phytophagous species by egg recognition through the presence of oviposition-deterring pheromones (e.g. Prokopy 1972, 1975; Oshima et al. 1973; Katsoyannos 1975; Prokopy et al. 1976, 1977, 1978; Rothschild and Schoonhoven 1977; Zimmerman 1979, 1982).

Among Lepidoptera, some species recognize conspecific eggs visually, preferring to lay their own on egg-free host plants or egg-free portions of them (Gilbert 1975, 1982; Benson et al. 1976; Wiklund and Ahrber 1978; Rausher 1979; Shapiro 1980, 1981a). Parasitoid wasps can distinguish between free and occupied hosts through chemical receptors present on the antenna and the ovipositor, thus avoiding superparasitism (Vinson 1976).

*Mechanitis lysimnia* (Fabricius, 1793), a common ithomine butterfly in southeastern Brazil (Brown 1979), lays its eggs in groups on several species of "joa" species of *Solanum* (Solanaceae) with spiny leaves. In the field, we verified large variations in the egg-clutch size of this butterfly. In the present work, we studied the butterfly’s egg-laying behavior with regard to several factors suspected to influence variation in egg-clutch size.

**Materials and methods**

Eggs of *M. lysimnia* (Fig. 1a) were sampled on host plants at two week intervals at the Horto Florestal de Sumaré, in Sumaré, São
Fig. 1. a Eggs of *Mechanitis lysimnia*, b egg-mimic pieces of string painted white and glued to the leaf, and c false eggs (spots of white nail polish) used in field experiments.