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A laboratory and field evaluation of *Macrocyclops distinctus*, *Megacyclops viridis* and *Mesocyclops pehpeiensis* as control agents of the dengue vector *Aedes albopictus* in a peridomestic area in Nagasaki, Japan

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Abstract. The use of the cyclopoid copepods *Macrocyclops distinctus* (Richard) *Megacyclops viridis* (Jurine) and *Mesocyclops pehpeiensis* Hu (Cyclopoida: Cyclopidae) as biological control agents against the dengue vector *Aedes albopictus* (Skuse) (Diptera: Culicidae) was evaluated. In the laboratory their predatory ability was highest against the younger instars of *Ae. albopictus* and none of the three copepods killed the fourth instar. Except for *M. viridis*, predatory ability was affected by the size of the container: the smaller the container, the higher the predation. A 4-month field test was conducted to examine the impact of these predators on wild *Ae. albopictus*. Thirty artificial containers were placed in a peridomestic area to allow *Ae. albopictus* colonization. We showed continuous and similar oviposition responses in treated and control containers. The densities of *Ae. albopictus* showed considerable short-term changes and were much reduced by the copepod species. *Macrocyclops* and the mixture of all three provided better *Ae. albopictus* control than either *Megacyclops* or *Mesocyclops* alone. When larval densities peaked in the control containers in August and September, the overall reduction due to the copepods was nearly complete. *Mesocyclops* inoculated alone had the highest population survival. However, the growth and survival of all the copepod species was poor when the three genera were mixed. Based on their performance and survival in the trial, *Macrocyclops* and *Mesocyclops* merit consideration as bio-control agents of *Ae. albopictus*.

Key words. *Aedes albopictus*, *Macrocyclops distinctus*, *Megacyclops viridis*, *Mesocyclops pehpeiensis*, growth, immature, mixture, oviposition, peridomestic area, reduction, Japan.

Introduction

Recently, copepods have emerged as a new tool for controlling mosquito vectors, particularly those inhabiting artificial containers. In Tahiti, *Mesocyclops leuckarti* (Claus) and *Mesocyclops aspericornis* (Daday) were successfully used against the dengue vector *Aedes aegypti* (L.) (Riviere & Thirel, 1981; Lardeaux *et al.*, 1992) and in Honduras this mosquito was suppressed in peridomestic containers by *Mesocyclops longisetus* (Thiebaud) (Marten *et al.*, 1994). In New Orleans, *Macrocyclops albidus* (Jurine) eliminated *Aedes albopictus* (Skuse) from tyre piles in a wooded area (Marten, 1990a, 1990b). More recently, in Vietnam, *Mesocyclops* sp. succeeded in eliminating *Ae. aegypti* (Nam *et al.*, 1998) from a number of villages. This is a major advance in the biological control of disease vectors.

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