CHAPTER 1

INTRODUCTION

Urban infrastructural development in urban areas creates new ecosystem and provides many receptacles of various sizes that allow water stagnation (Abu Hassan *et al.*, 2005: Sapari *et al.*, 2006). Deterioration of water quality and water stagnation in such structures promotes the increase in mosquito population in the ecosystem. These structures include drains, septic tanks and water valve chambers (Sapari *et al.*, 2006). Storm drains that are designed to convey storm water unfortunately carry many types of pollutants including domestic and commercial wastewater. The stagnant water and poor water quality in drain and other structures are promoting the increase in mosquito population in the ecosystem (Mariappan, 2000). Various other pest species may also spawn in such polluted water causing nuisance and public health problems to the community. Mosquito breeding in storm water drains is fluctuating depending on the seasonal variation (Metzger, 2004). Higher temperature and humid environment were found to be more conducive for the breeding (Subodh, 2008).

Mosquito in urban areas is one of the major health concerns because it is a virus-transmitting vector particularly the *Aedes* mosquito which causes fatality to 12000 people world wide and infects more than 50 million people per year due to dengue fever (WHO, 2002). Statistics from Malaysia showed 48185 cases and 98 deaths in 2007 (Abdul Rahman, 2008).

The common methods of control for this vector are by fogging and larviciding. However, this method of control may lead to environmental problems. Furthermore, the statistic indicates that the number of dengue cases is still increasing every year (Abdul

Rahman, 2009) suggesting that the existing method of control is ineffective.The common methods of control for this vector are by fogging and larviciding. However, this method of control may lead to environmental problems. Furthermore, the statistic indicates that the number of dengue cases is still increasing every year (Abdul Rahman, 2009) suggesting that the existing method of control is ineffective. Perhaps, the ecosystem is facing imbalance because the chemical used in the fogging apparently killed the predator rather than the mosquito itself. It is clear that an alternative control is warranted to overcome this global problem of mosquito borne disease.

In order to provide an effective control, it is necessary to examine the life cycle of the mosquito. The mosquito goes through four distinct stages of life cycle; egg, larva, pupa and adult. Each of these stages can easily be identified base on their unique appearance. Although female mosquitoes may lay up to 100 to 200 eggs per hatch, the eggs take from days to months to hatch. It can only deposit an egg batch every 7 or 10 days. Under favorable conditions, eggs will hatch approximately within 4 to 5 days (Otero *et al.*, 2005). A male adult mosquito's life span is only about two weeks, while female can survive up to more than a month. It gives her great opportunities to feed on blood and lay many batches of eggs. She is capable of producing thousands of eggs in her life time, which one of the main reasons why mosquitoes are so prolific and why so many serious diseases quickly become epidemics in many part of the world.

Mosquito controls are most effective when directed at immature stages in standing water rather than at adults and is best conducted using a combination of techniques including biological, physical, chemical and legal control (Kay and Nam, 2005). Biological control uses natural enemies of mosquitoes like Micronectidae. This study is one of the efforts to improve mosquito management practices using Micronectidae as biological controls of mosquito at larval stage. Several innovative methods using bio-control have been investigated which include the use of planarian (Suprakash and Aditya, 2003), fish (West *et al.*, 1995; Wu *et al.*, 1987) and copepod (Nam *et al.*, 2000). The research stated that the planarians have selective choice for the eggs, larvae or pupae stages and at the same time for the different

groups of mosquitoes. The planarians generally avoid very small mosquito larvae (first stage of larval form) because of their fast movement. These interesting phenomenons suggests that the planarians like mosquito larvae in small drains of swampy areas that are ideal for mosquito breeding and at the same time planarians could easily live and multiply. Fish application as biological control of mosquito by West *et al.*, (1995) in Australia concluded that introducing fish species to a new ecosystem is strictly prohibited to maintain the balance ecosystem. He suggested that the native fish species should be manipulate for a more efficient control of mosquito at larval stage. Research from China by Wu *et al.*, (1987) suggested that a model ecosystem as an ecological control of mosquito like stagnant water in container containing the mosquito predator at aquatic phase is an efficient method as it is portable and have a low cost maintainance.

The application of copepod can only be most effective with the combination of copepod from *Mesocyclops* spp and entomopathogenic bacteria, from *Bacillus* spp (Nam *et al.,* 2000). An effective control of mosquito larvae was attained when *M aspericornis* and *Bti* were combined. Reapplication of *Bti* is needed to achieve satisfactory control levels because the controlling efficacy of *Bti* decreases a few days after application under natural settings. However, their applications are restricted by ecological adaptations based on geographical regions.

This thesis examines the use of an ecological approach of mosquito control by using Micronectidae. Micronectidae is a Family of aquatic insect of 2 mm size with a life cycle almost similar to mosquito from Order Heteroptera. It was chosen in this study for biological control of mosquito because of its larvivorous characteristic. Furthermore, Micronectidae was found to have wide distribution throughout the world that lives in non-polluted water environment (Cheng *et al.,* 2006). The taxonomy classification of this insect was studied by Nieser (2000). However, its detail life-cycles and efficacy on the feeding habit was not ascertained.

1.1 OBJECTIVES

The objectives of this research are:

a. To study the niche of Micronectidae

i. The study consisted of the analytical measurement of the abiotic and biotic components of the ecosystem of Micronectidae.

ii. To apply such condition for mosquito control in residential areas.

b. To determine the efficiency of Micronectidae as biological control agent for mosquito in man-made containers

i. The approach of the study focuses on the application of this biological control agent in three residential areas; Taman Maju, Bandar Universiti and Taman Tasek Putra.