

# POPULATION DYNAMICS OF FRESHWATER MOLLUSCS (GASTROPOD: *MELANOIDES TUBERCULATA*) IN CROCKER RANGE PARK, SABAH

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## ABSTRACT

*A study of population dynamic of freshwater molluscs (gastropod: Melanoides tuberculata) at Crocker Range Park was conducted at two sites during 15 to 24 October 1999. Only one species of fresh water gastropod belonging to family Thiariidae was found and identified. Melanoides tuberculata dominated the fast flowing upper and middle stream. They were found in abundance within their standard length size range of 0.2 -2.5cm. The relationship between their diameter and standard length of the species was investigated. While a positive correlation ( $R^2=0.9227$ ) was obtained for samples collected from the Mahua river, those from Baiayo river gave a contrasting value ( $R^2=0.201$ ).*

## INTRODUCTION

Crocker Range Park (CRP) is an extensive mountain area, bestowed with fast streams and rivers waters. The river system in CRP provided very suitable habitats for some species of molluscs to thrive. Gastropods are known to be found in abundance in very fast-flowing headwaters. The aquatic snails of CRP have not been studied with respect to their population dynamic, richness and diversity.

The phylum mollusca is a large assemblage of animals having diverse shapes, sizes, habits and occupy different habitats (Subba Rao 1993). Based on their habitat preference, molluscs can be classified into aquatic and land communities. Although molluscs are common components of the benthic communities, their role in the dynamics of the aquatic ecosystem and their contribution to biomass production is not well known. The freshwater habitats are taxonomically impoverished in comparison to the marine habitats. Marine molluscs have received more attention because of their aesthetic and gastronomic appeals (Subba Rao 1993). In comparison freshwater molluscs are drab coloured and have attracted less attention. Freshwater molluscs have been known to play significant roles in the public and veterinary health and thus need to be scientifically explored more extensively.

There exist approximately 5,000 species freshwater snails that inhabit lakes, ponds and streams worldwide (Abbott 1950). Most are members of the subclass Pulmonata and some of the subclass Prosobranchia. Both subclasses belong to the class Gastropoda (F.G. Thompson 1984).

## MATERIALS AND METHODS

### Study area

The expedition took place in Tambunan District, Sabah, adjacent to the Crocker Range Park (CRP) in southeastern Sabah. The park stretches from south of Kundasang in the north to Tenom in the south, approximately between latitudes 5° and 6°N and longitudes 115° and 119°E. To the east CRP is bordered by the flood plain of the Pegalan/Padas river and to the west by the coastal plain of the west coast of Sabah. Mahua river is situated 40 minutes from Tambunan and located near the base camp within the primary forest. Baiayo river is situated 10 minutes from Keningau and located near a recreational park.

### Sample Collection

The mollusc samples were collected from three sampling sites in the upper, middle and lower Mahua stream and two sites from middle Baiayo river. The freshwater molluscs were captured on a 200-metre transect along each sites of Mahua stream while molluscs from Baiayo river were captured in a 1-metre triplicate transect at each site. The catch from each sampling trips was recorded separately with the length and diameter of each molluscs noted. Some of the mollusc specimens collected were fixed in 10% formalin and later preserved in 70% ethanol. The identification of mollusc species was carried out both at the study areas and in the laboratory. The identification of mollusc species was based on the published books by D.S. Hill, M.L. Shabdin and Nicolas Pilcher (*Provisional Checklist of the Molluscs of Sarawak and Sabah*), S. Peter Dance (*The Encyclopaedia of Shells* edited), and Fred G. Thomson (*Field Guide to the Freshwater Snails of Florida*).

## RESULTS

### Taxonomic status

Only one species of freshwater as gastropod belonging to the family Thiaridae was found and identified as *Melanoides tuberculata* (Muller 1774). The species was found in abundance and dominated the fast flowing upper and middle stream. This species is native to a large part of Africa, the eastern Mediterranean, and throughout India, Southeast Asia, Malaysia, southern China north to the Ryukyu Islands of Japan and south and east through the Pacific Islands to Northern Australia and the New Hebrides (Pace 1973). This species was introduced into florida (Dundee 1974; Burch and Tottenham 1980a, 1980b; Burch 1982) and is now widely distributed throughout the state.

### Ecology and habitats

Both rivers, the Mahua and Baiayo, flow over rock and gravel beds. The rivers are shallow and fast flowing with many small rapids. Boulders and rocks mostly line the riverbanks. Both rivers are generally clear even after rain within the catchment areas upstream. Freshwater ecosystem can be generally classified into lentic or lotic. The family Thiaridae are exclusively found in lotic habitats. Their shells exhibit certain structural features in response to their life in flowing waters.

**Species population**

A total of 934 specimens were collected from the two sampling sites. Only *Melanooides tuberculata* (Muller 1774) was recorded from the field collections. From the survey, 94% of the species caught was from Baiayo river (Fig. 1). Each collection site along the Mahua river gave different sample sizes and the highest number of individuals were collected from the middle stream (31 individuals), followed by 20 individuals from the upper stream and only 3 down stream (Fig. 2). Two sampling sites along the Baiayo river also gave the same distribution pattern with respect to sample individually collected. The first site gave 779 individuals while 81 were collected at the second site (Fig. 3). The population of *Melanooides tuberculata* seemed to dominate in the middle stream of the river followed by the upper stream.

**Standard length frequency and size diameter and standard length relationship**

Our study revealed that *Melanooides tuberculata* collected from the Mahua river were within the size length range of 1-2.5cm (Figs. 4, 5, 6) whereas those from Baiayo river were within the size length range of 0.2-2.0cm (Figs. 7, 8). The significant differences between the standard length sizes of samples collected from these two sites probably stemmed from the feeding competition among the gastropods. The high gastropod populations in the Baiayo river generated stiff feeding competition among the gastropods resulting in less than ideal nutritional habitat needed on the growth of juveniles and broods. The diameter and standard length relationship between individuals found in the Baiayo river is insignificant ( $R^2 = 0.201$ ). However the relationship between diameter and standard length of species from the Mahua river is very significant ( $R^2 = 0.9227$ ) (Figs. 9, 10).

Table 1. Common taxonomic chart for some Malaysian freshwater mollusks

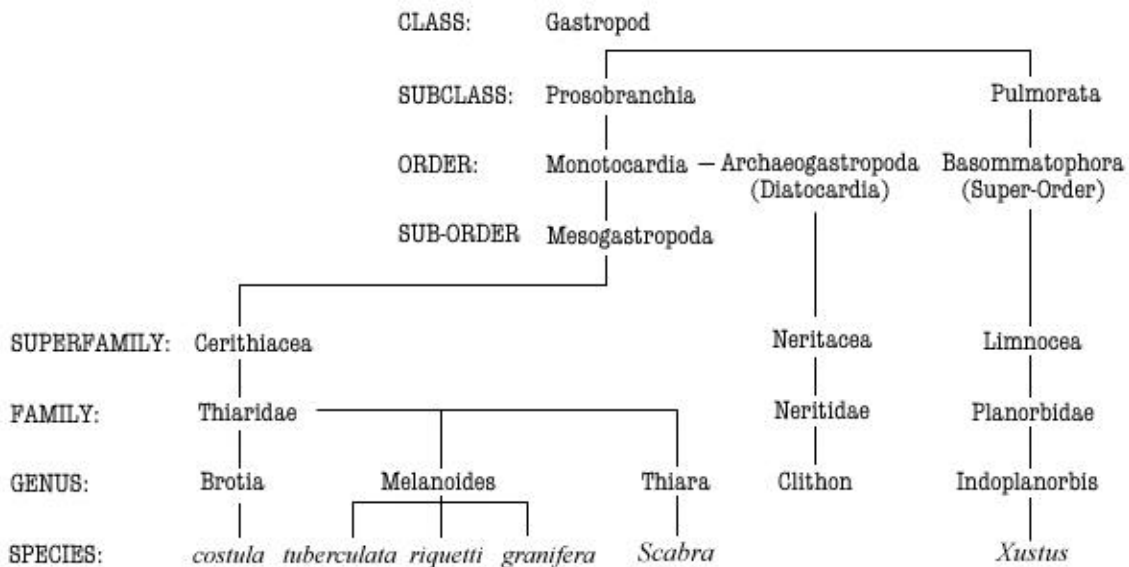


Table 2. Habitat distribution for some Malaysian Freshwater Molluscs

Name of the Family	River & Stream	Canals	Paddy Field	Ponds	Lakes
1. Corbiculidae	+	-	-	-	+
2. Bithyniidae	+	+	+	+	+
3. Lymnaeidae	-	+	-	+	+
4. Planorbidae	-	+	+	+	+
5. Thiaridae	+	-	-	+	+
6. Unionidae	+	-	-	+	+
7. Viviparidae	-	+	+	+	+

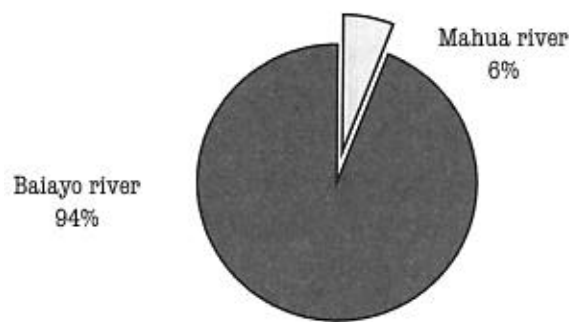


Fig.1: Percentage of *Melanoides tuberculata* composition caught from Mahua and Baiayo river, Crocker Range Park

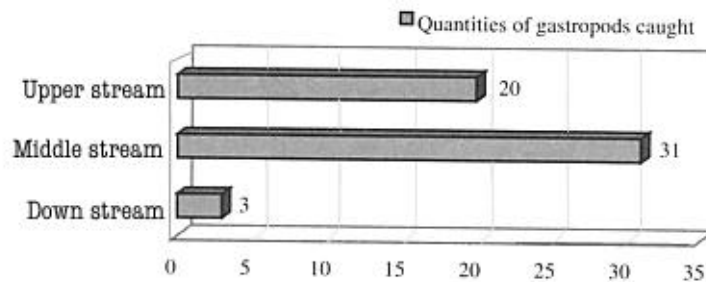


Fig 2: Quantities of gastropods (*Melanoides tuberculata*) caught from Mahua stream, Crocker Range Park

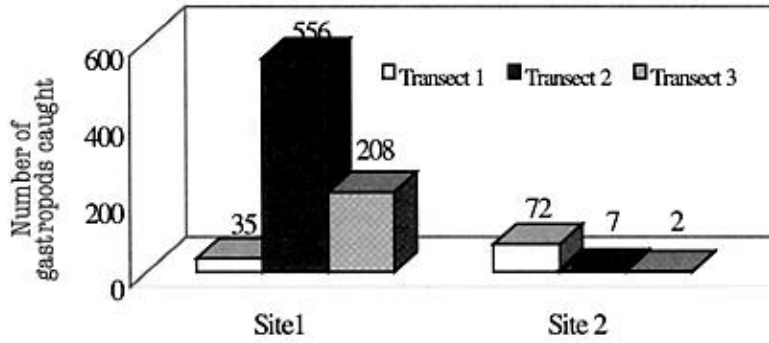


Fig.3: Quantities of gastropods (*Melanoides tuberculata*) caught from Baiayo river, Crocker Range Park.

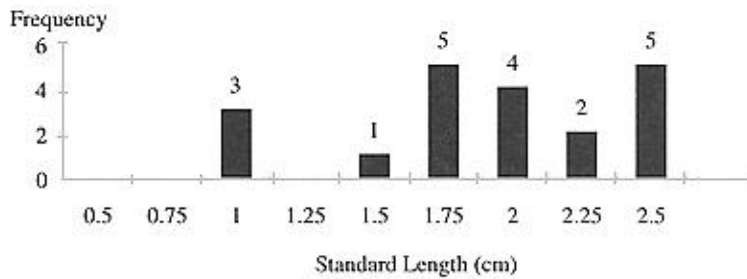


Fig.4: Size length frequency of *Melanoides tuberculata* from upper stream Mahua river, Crocker Range Park.

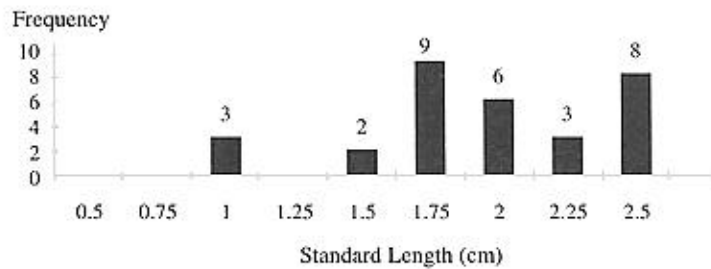


Fig.5: Size length frequency of *Melanoides tuberculata* from middle stream Mahua river, Crocker Range Park

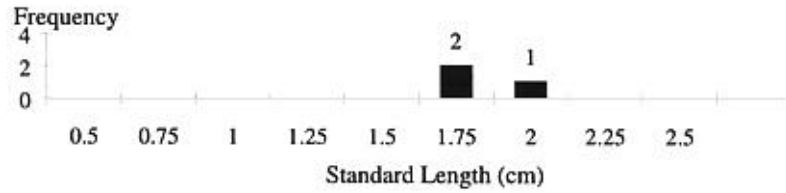


Fig.6: Size length frequency of *Melanoides tuberculata* from lower stream Mahua river, Crocker Range Park

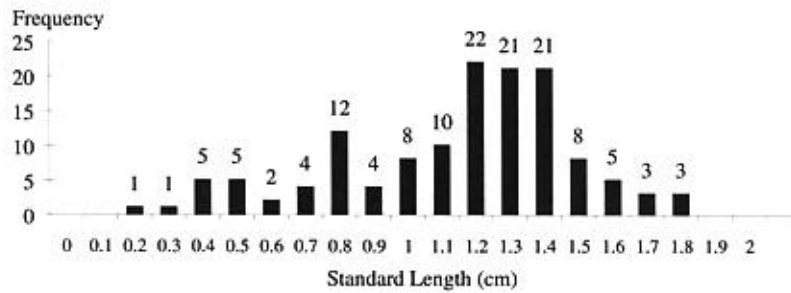


Fig.7: Size length frequency of *Melanoides tuberculata* from site 1 Baiayo river, Crocker Range Park

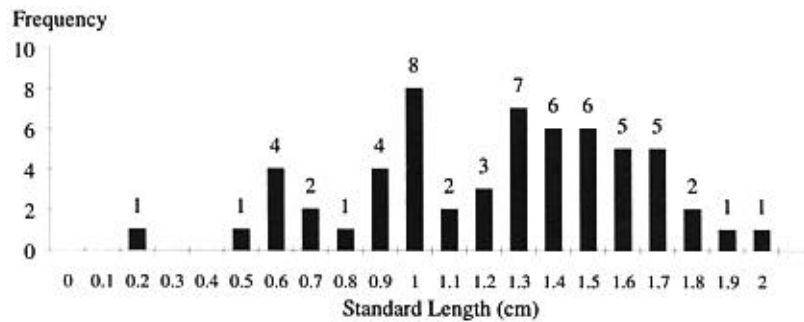


Fig.8: Size length frequency of *Melanoides tuberculata* from site 2 Baiayo river, Crocker Range Park

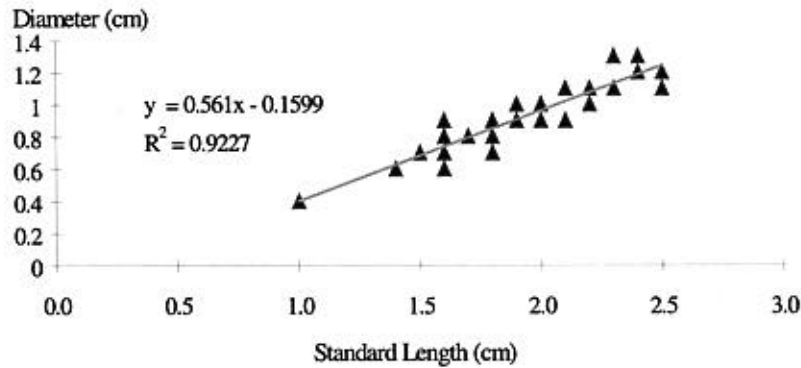


Fig.9: Relationship between diameter and standard length of *Melaniodes tuberculata* from the Mahua river.

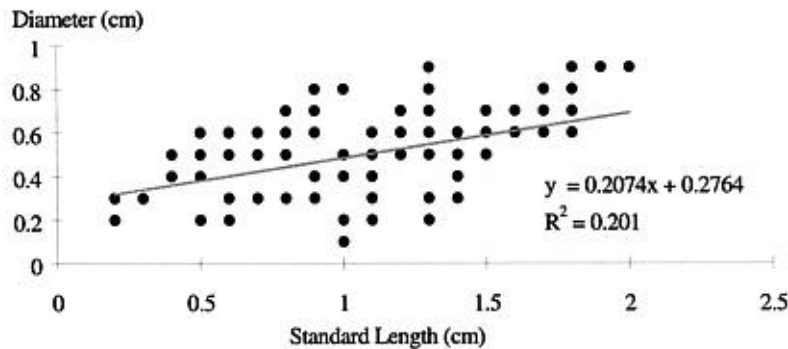


Fig.10: Relationship between diameter and standard length of *Melaniodes tuberculata* from the Baiayo river.

The freshwater gastropods are represented by eight families, comprising at least 13 genera. The prosobranchs, distinguished by possession of an operculum for closing the shell and, in most cases, a true gill in the mantle cavity, comprise the Viviparidae, (*Siamopaludina* and *Filopaludina*), Ampullaridae (*Anentome*), Bithyniidae (*Bithynia* and *Wattebledia*), Thiariidae (*Brotia*, *Thiara*, *Melanoides*) and Buccinidae (*Anentome*). *Melanoides tuberculata* is the commonest and most wide-ranging member of the family Thiariidae, found in almost any kind of freshwater. The presence or absence of the forest covers only weakly affects the distribution of freshwater molluscs. The strongest constraint is the amount of dissolved calcium in the water, since calcium is an essential constituent of the shell.

Freshwater molluscs, especially gastropods are important from the medical and veterinary public health point of view. About 100 species of freshwater gastropods are reported to act as intermediate hosts for the diagnostic trematode parasites and among Prosobranchs, members of the family Pilidae and Thiariidae were recorded to harbor larval trematodes (Subba Rao 1993). *Melanoides tuberculata* and *Melanoides granifera*, are medically important because they can serve as first intermediate host for the human lung fluke *Paragonimus westermani* (F.G. Thompson 1984, M.G. Harasewych 1998, D.S. Dundee and A. Paine 1999).

There are many species of land snails currently listed as endangered, threatened or extinct. Many of these species have adapted to very specialised habitats that are currently being rapidly destroyed or irreparably damaged by mankind. Our understanding of mollusc biology and its role in the ecosystem is still insufficient especially their production rates and turnover values. More studies are needed to establish the importance of various environmental factors that produce a collective effect on the nature and distribution of freshwater molluscs.

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