

**A COMPARISON OF SHELL SIZE AND MEAT WEIGHT BETWEEN  
POPULATIONS OF THE BIVALVE *ANADARA ANTIQUATA* (LINNAEUS  
1758) FROM FOUR SITES EXPERIENCING DIFFERENT LEVELS OF  
EXPLOITATION PRESSURE IN ZANZIBAR.**

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**ABSTRACT**

*A comparative study on the shell size and meat weight between Anadara antiquata populations harvested from four intertidal mud flats subjected to varying exploitation pressure in Zanzibar was undertaken between August and December 2000. An analysis of the data from the four study locations Mazizni, Mbweni, Kisakasaka, and Jambiani showed that much smaller sized Anadara, with low meat weights were being harvested from Mazizini and Mbweni in comparison to those harvested from Kisakasaka and Jambiani. The first two sites were areas in which there was heavy exploitation of the animals in comparison to the last two. Mazizini and Mbweni were always found to be occupied by shell collectors on almost all low tides. The availability of alternative livelihood activities at Kisakasaka and Jambiani appeared to be responsible for the reduced exploitation pressure on the cockles, reflected by the presence of comparatively large and heavy animals. The results of this investigation are given together with management suggestions including the introduction alternative livelihood activities, which may lead to better growth and meat yield of this locally valuable molluscs.*

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**INTRODUCTION**

The bivalve molluscs of Tanzania have been a subject of considerable research since the mid sixties to the early eighties. *Anadara antiquata* was the subject of a report by Matthes (1968) while writing on the intertidal fauna of the mudflats of the Dar es Salaam coast. Mwaiseje (1982) noted the active involvement of women and children in the collection of this species from the beaches of the same coast, and made suggestions on the need for scientific documentation of this type of fishery and its recognition in contributing to the protein requirements of especially the poor, who are often not able to get traditional fish. In 1974, Matthes wrote on the potential of *Anadara antiquata* for aquaculture in Tanzania while in the mid eighties, Kayombo (1985) studied the growth and reproductive biology of this species and also recommended it for aquaculture. Other studies have examined bacterial contamination of the species, and cautioned

on the health risk associated with the consumption of these organisms (Kudoja 1987, Sebastian et. al. 2002).

Elsewhere, *Anadara* has been cultured in several places including Japan, Malaysia, China, the Phillipines and Borneo (Bardach et. al. 1972), in addition, *Anadara* species have been reported to be important in the traditional fishery of Malaysia (Chan 1985).

The fishery of mollusks in Zanzibar is indeed a silent but locally important source of protein, and monitoring of the trend of the fishery is a much needed exercise. To date, no studies have been conducted to determine the conditions of the stocks in the various collection sites in order to determine whether or not depletion was taking place. This project is an attempt to fill that gap, and get some baseline information on the state of the stocks in relation to exploitation. The research is aimed at the determination of shell size and meat weight,

and at a comparison of *Anadara antiquata* populations from four sites experiencing differing levels of exploitation pressure, thereby getting evidence for the impact of exploitation.

#### MATERIALS AND METHODS

The studies were conducted at four sites namely, Mazizini and Mbweni all located south of Zanzibar town. These sites experience heavy occupation by shell collectors on almost all spring low tides. The areas don't have much alternative livelihood activity especially for the elderly,

women and children who form the majority of shellfish collectors. They collect these shells primarily for domestic consumption, and little gets sold at the markets in Zanzibar town. The other sites, Kisakasaka and Jambiani are located to the south and East of Unguja island respectively,(see fig1). Much in common with the first two sites, each is near to a locally large population. However, Kisakasaka and Jambiani are also areas where seaweed farming is practiced. Thus there is an alternative means of livelihood and income generation in addition to shellfish and octopus fishing.

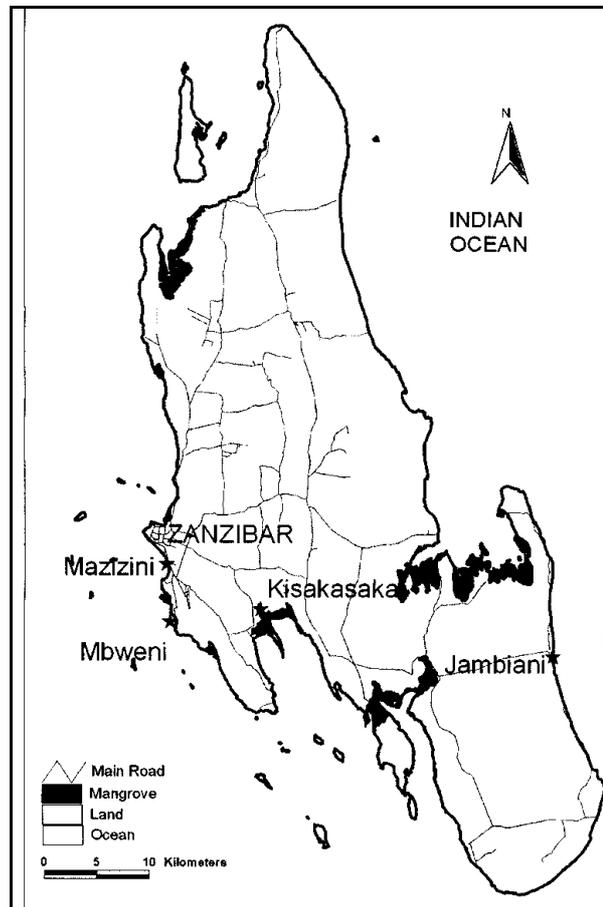


Figure 1 Map of Zanzibar showing study sites

**METHODS**

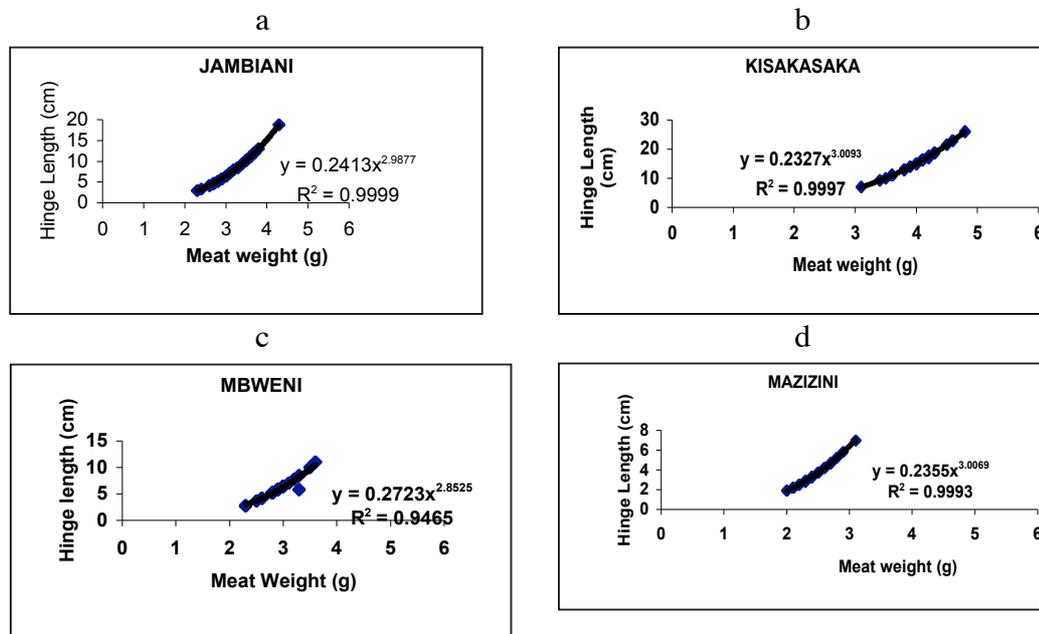
Samples of the mollusks were bought from collectors at the study sites. Others were collected from the sites and all were pooled together.

The meat of each cockle was scooped out of the shell and weighed using a sensitive electronic balance (Satorius model). Shell lengths (hinge length) were measured, using a sensitive a venire calipers. The hinge being the straight edge along which the two shells

articulate. This portion was selected because it is rarely found broken under natural conditions.

**RESULTS**

Figure 2 (a - d) shows the hinge length and meat weight relationship in the *Anadara* populations from the four study sites. As the figures show, there is a very strong positive co-relation between hinge length and meat weight.



**Figure 2** Hinge length and meat weight relationships in the *Anadara* populations

**DISCUSSION**

The mollusks harvested in Zanzibar primarily belong to the species *Anadara antiquata*. In all the study sites, this species was highly represented in the collections. This is an indication that the species is sufficiently abundant and easy to pick from among the shoots, roots and rhizomes of the sea grasses that occur in the four study locations.

The sizes of the cockles in Mbweni and Mazizini were smaller and with the least meat yield as compared to those in Jambiani and Kisakasaka (see Fig 2). Given the high frequency of collection of cockles in the first two sites, it is only logical to conclude that there is depletion of large cockles, hence the observed decline in size and consequently low meat weight. The proximity of these sites to Zanzibar town in the case of Mazizini, and Mbweni village in the case of

Mbweni site make them very accessible to many collectors. These areas were indeed almost permanently occupied during all spring low tides and therefore under very high exploitation pressure, which is here reflected by the abundance of small sized, low meat weight animals. These observations are typical of a resource which is under heavy exploitation. Similar observations have been noted in frequently fished coral reefs, where there has been a decline in both size and catch (Jiddawi per.com).

In the other two sites, Jambiani and Kisakasaka, it appears that the populations are not subjected to intensive exploitation, with the result that there are considerable populations of large animals with bigger meat weights. Since in terms of proximity to a large human population Jambiani and Kisakasaka sites are not very different from Mazizini and Mbweni (there is a locally large human population at Kisakasaka just within reach of the cockle beds and similarly the Jambiani cockle beds are within reach of the nearby human population), the abundance of large heavy cockles, reflected in the figures is due to reduced exploitation pressure on the cockles at Kisakasaka and Jambiani. It is argued here that this is due to there being other live-lihood activities at these sites, as in addition to cockle collecting at Kisakasaka, villagers engage themselves in fin-fish fishing using mainly fixed stake fish traps which are easily made from mangrove aerial roots. Other activities include crab (*Scylla serrata*) catching; charcoal making and sea weed farming. In the case of Jambiani site, the villagers here also have alternative livelihood activities including coconut husk rope making; octopus fishing and seaweed farming. These activities tremendously reduce the pressure on the cockles with the result that relatively large sized cockles are found in the sites. It is obvious that exploitation pressure reduction through the introduction of other livelihood activities is beneficial in that it creates better growth and

survival conditions for a resource. It is suggested that aquaculture activities be encouraged along the coast so as to relieve the pressure on such organisms as these. Alternatively closing seasons could be introduced as a management tool, to avoid imminent depletion of the cockles.

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