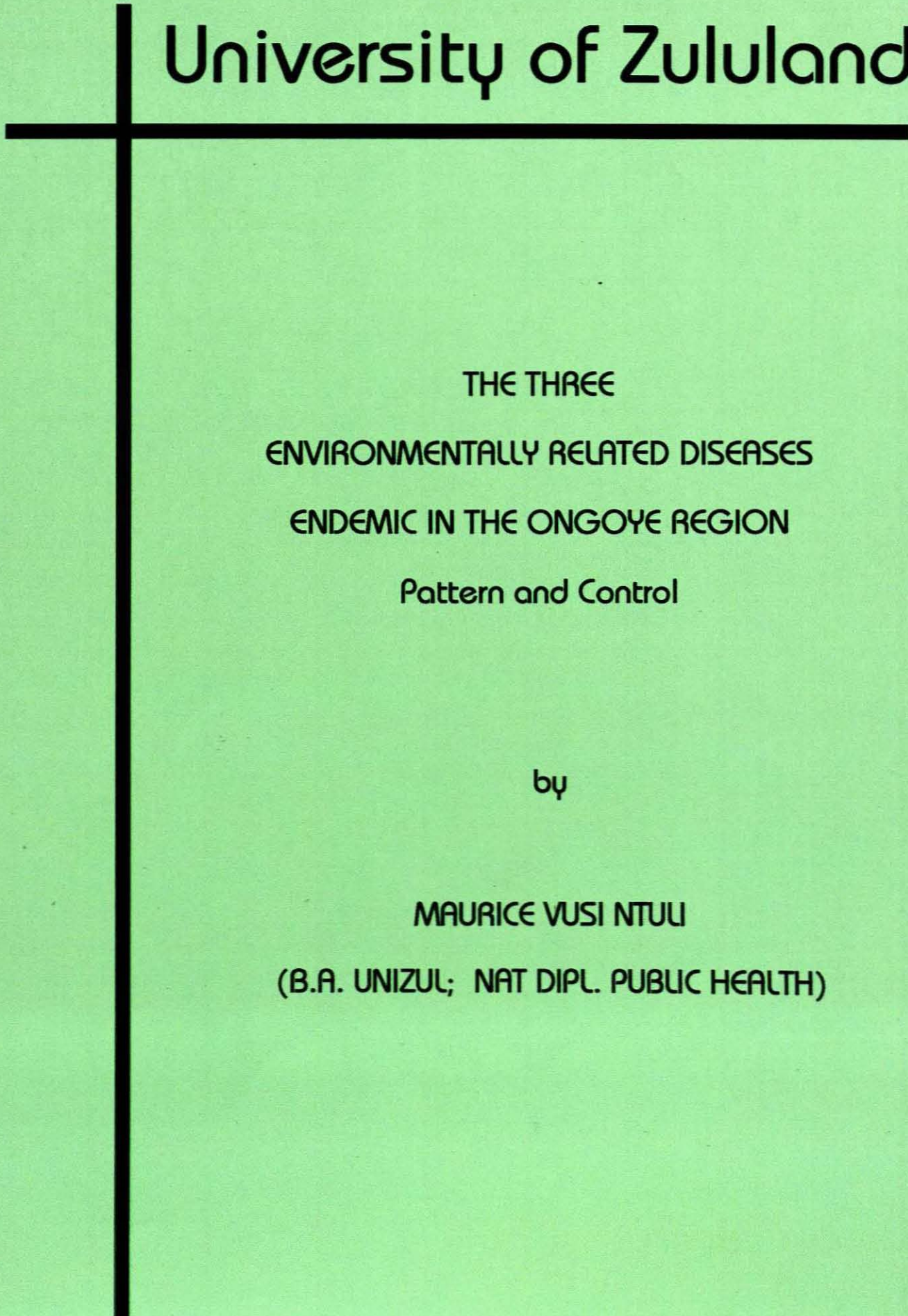




# University of Zululand

THE THREE  
ENVIRONMENTALLY RELATED DISEASES  
ENDEMIC IN THE ONGOYE REGION  
Pattern and Control

by

MAURICE VUSI NTULI  
(B.A. UNIZUL; NAT DIPL. PUBLIC HEALTH)

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ENDEMIC IN THE ONGOYE REGION : PATTERN AND CONTROL**

Submitted in partial fulfilment  
of B.A. Honours Degree requirements  
in the Department of Geography  
at the University of Zululand

SUPERVISOR : PROF. L.M. MAGI

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KWA-DLANGEZWA



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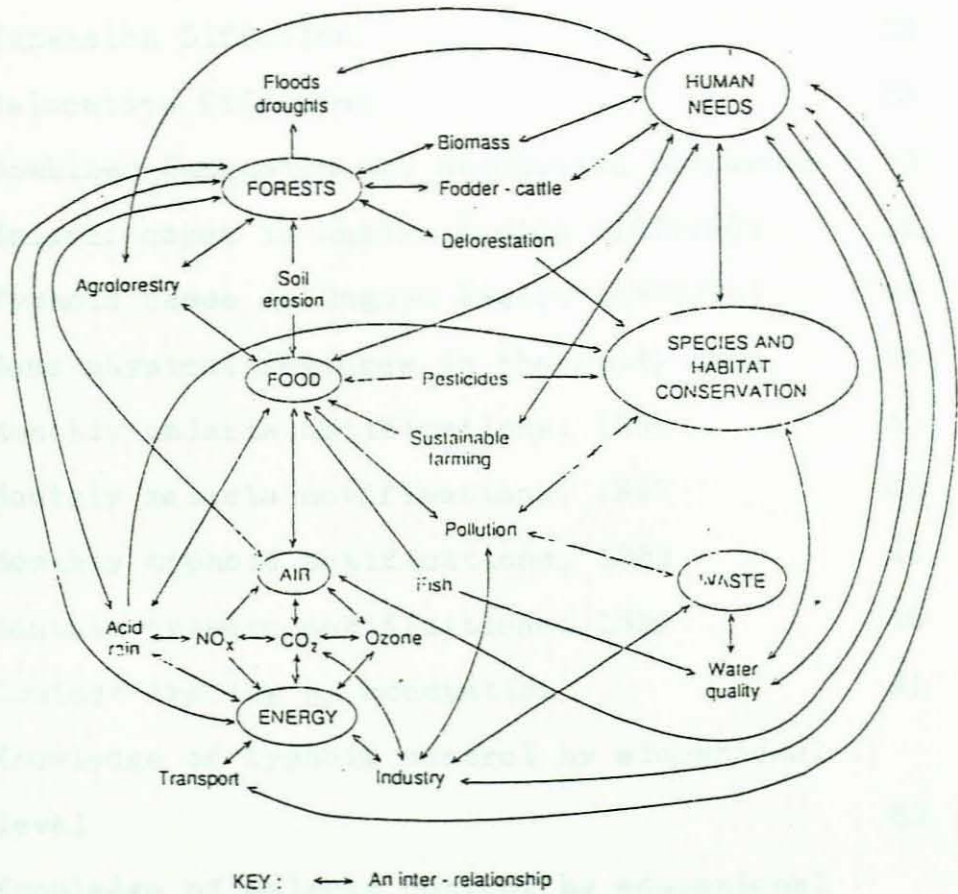
Professor L.M. Magi gets more credit and honour for making it possible for me to pursue a research on Public/Environmental health (Medical Geography) which is a part discipline of human geography. It is through his encouragement that in 1993 I am likely to go and study towards a Master's degree in Public Health in American universities.

I wish also to thank my fellow colleagues and students for moral and academic support during the hard times of researching.

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- It is possible to maintain that there are many human problems, such as poverty and disease, which should be tackled before we turn to environmental matters. However, it is more than clear that many of these are closely inter-related with environmental problems."



The inter-relationships between environmental problems. Reproduced (with permission) from Trudgill (1990a).

Source: Trudgill, S. (1991)

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## CHAPTER 1

### ORIENTATION OF THE STUDY

#### 1.1 INTRODUCTION

Certain events bear evidence that the problems presented by environmentally related diseases have not been solved. This state of affairs is not in line with the statement issued out by the World Health Organisation (WHO) which states "Health for all and to all by the year 2000." The years ahead of us before the turn of the century looks like a short period to have solved the above-mentioned problems unless some new approaches to combat the problems (to be mentioned later on) are adopted.

#### 1.2 BACKGROUND

The prevalence of the three diseases namely malaria fever, typhoid fever and bilharzia (schistosomiasis) comes about as a result of the nature of the environment together with human invasion of such an environment. The most important factor is that, without the human invasion of the environment, there could be no prevalence of these three diseases. This, therefore, suggests that humans have invaded the mosquito environment and thus contracted malaria fever and spread the same to others. Humans have also invaded the water environment by contaminating water with their excreta and thus spread typhoid fever and bilharzia (schistosomiasis).

The three diseases, malaria fever, typhoid fever, and bilharzia (schistosomiasis) are considered to be troublesome in many areas of the republic of South Africa (Kustner, 1990 and Kassner, 1990.) The area of investigation, the Ongoye region, is no exception to this rule. It is this widespread occurrence of the three diseases which influenced the researcher to conduct this study. The apparent ineffectiveness of both the KwaZulu government and the communities in the study area to combat these diseases has left me, as an investigator in deep thought as to what is to be done to eradicate these diseases. During the preliminary investigations it was observed that the pattern and control majors of these diseases are apparently known to the KwaZulu government and the communities, but still the occurrence cannot be completely prevented. Some control measures are seemingly practised by the same government with no apparent reduction in the number of occurrences of these diseases.

This inquiry is therefore interested in finding out the pattern and the extent to which such pattern affects the control measures. The inquiry further seeks to find out the extent to which the KwaZulu government and the communities have tried to combat or eradicate the diseases in question.

### 1.3 THE PROBLEM

The geographic problems and health problems as they both affect humans are viewed simultaneously in this research paper. The problem can therefore be classified as falling into the field of medical geography.



The researcher in looking at this problem, therefore, emphasizes the pattern or paths followed by three diseases, spatially as well as how they spread and diffuse in space. The investigation of the pattern is concurrent with that of the control measures adopted to prevent the further spread of the diseases to other areas that are free of infection. The extent to which the environment is effectively supporting these diseases which in turn affect humans is closely studied in this investigation.

This research inquiry has four basic aims:-

- (a) To reveal the extent to which the three diseases are perceived to be related to the environment.
- (b) To indicate the extent to which the control measures against these diseases have an impact on the environmental occurrence of the same diseases.
- (c) To reveal whether or not the emerging pattern of the three diseases is related to community health programmes in place in the study area.
- (d) To pinpoint some demographic variables that are related to the understanding of the occurrence of the three diseases in the study area.

#### 1.4 IMPORTANCE OF THE STUDY

This research paper serves as a motivation to the scholars in the field of medical geography to research more on these three



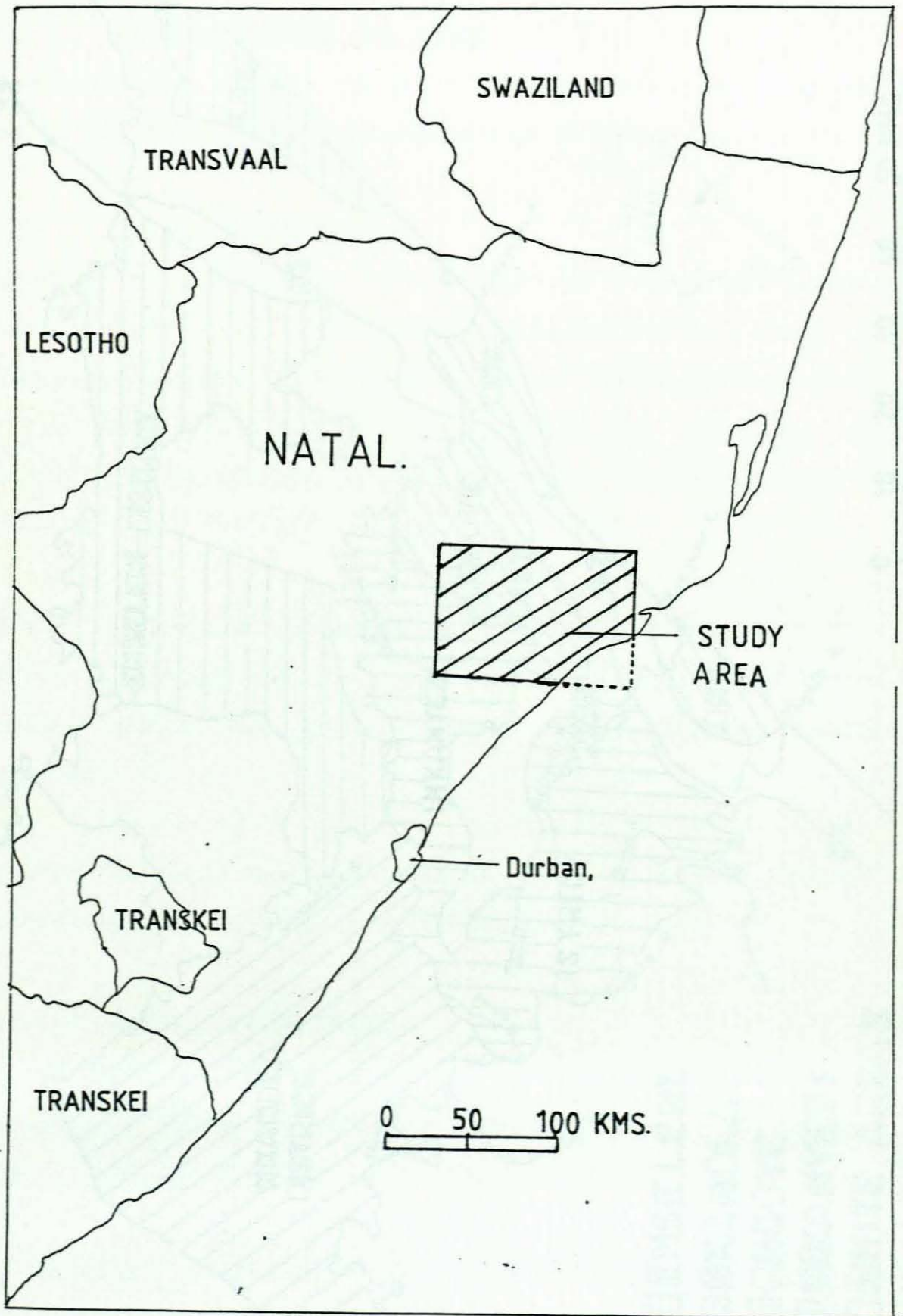
spatially related diseases. More studies could also be considered for other environmentally related diseases like plague (transmitted through rat fleas), typhus (transmitted through lice) and rabies (transmitted through dogs, rodents and fleas). In showing that the three environmentally related diseases are related to one another and to the environment, Ntuli (1989:6) writes:

..... typhoid is related to certain component of the environment such as the ground, the slope of the ground which increases run-off thus pollutes our water source, food which comes from the ground, water which runs on the ground, and flies which breed on the ground.....

From the above quotation it is clear that both bilharzia (schistosomiasis) and malaria fever are also related to the environment. The former disease is contracted through criss-crossing or swimming in the rivers infested with bilharzia parasites. For the latter disease, pools of water will be needed to favour the breeding of malaria-carrying mosquitoes.

According to the WHO (World Health Organisation), the year 2000 has been claimed as the year for "health for all." This paper, besides serving as an information resource, it is also contributing towards the increase of literacy information on medical geography. This information will be highly needed and be of benefit for the year 2000 and for the emerging New South Africa.

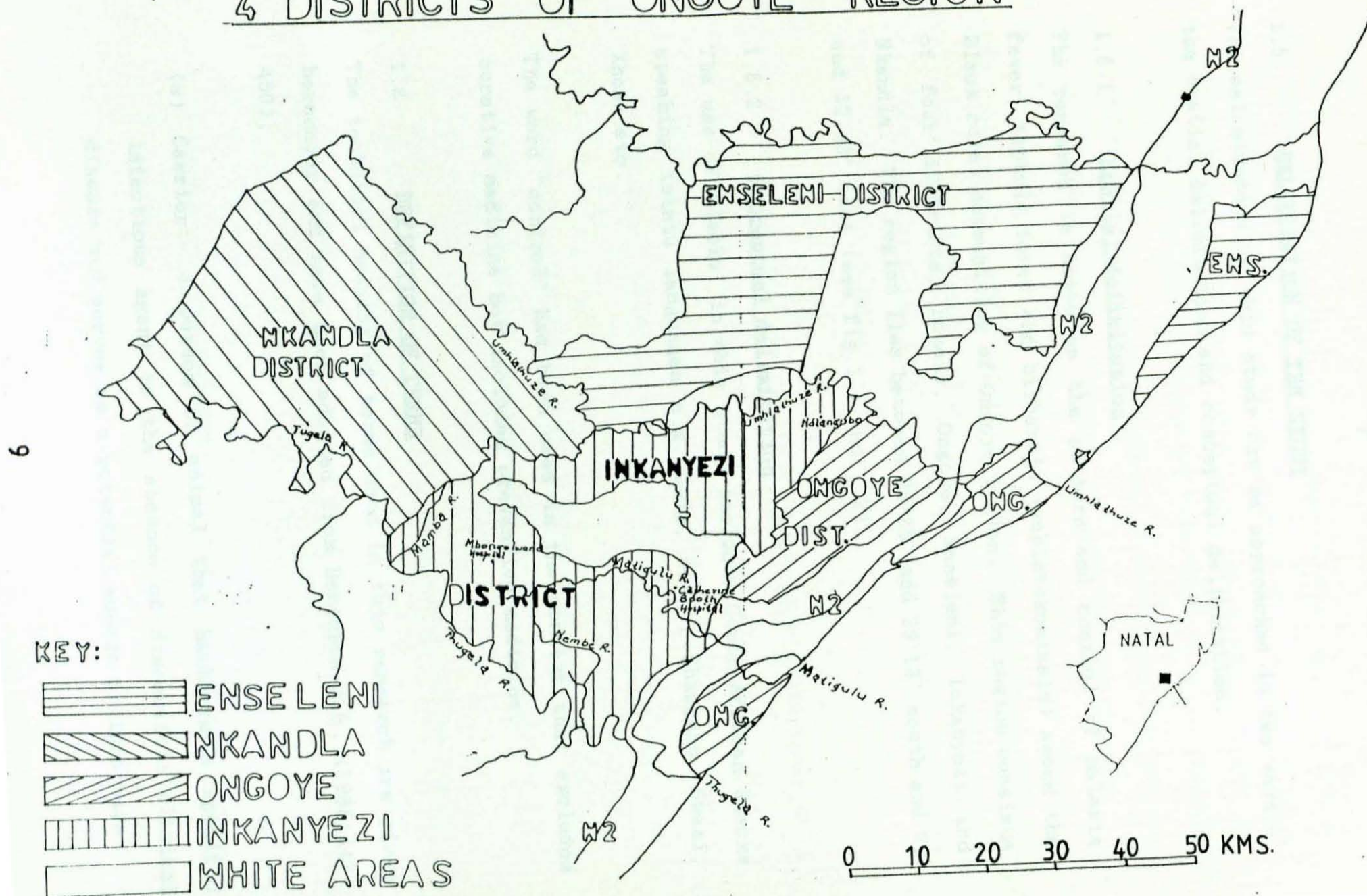
# REGIONAL SETTING OF THE STUDY AREA





**Fig.1.2**

#### 4 DISTRICTS OF ONGOYE REGION





## 1.5 DELIMITATION OF THE STUDY

The delimitation of this study can be approached in two ways:- the spatial delimitation and conceptual delimitation.

### 1.5.1 Spatial delimitation

The research is based on the pattern and control of malaria fever, typhoid fever and bilharzia (schistosomiasis) among the Black rural communities of Ongoye region. This region consists of four districts, namely, Ongoye, Enseleni, Inkanyezi and Nkandla. The region lies between 28 25' and 29 13' south and 31 and 32 43' east (see fig.1.1 and 1.2).

### 1.5.2 Conceptual delimitation

The use of Blacks' in this study includes South African Blacks speaking isintu languages e.g. Zulu, Sotho, Shangaan, Swazi, Xhosa etc.

The word "control" has been used in the context that excludes curative medicine but includes prevantive medicine.

## 1.6 DEFINITION OF TERMS

The technical meaning of terms used in this research are given hereunder and have been adopted from Benenson A.S. (1985:447-450).

- (a) Carrier:- a person or animal that harbours a specific infectious agent in the absence of discernible clinical disease and serves as a potential source of infection.

- (b) Communicable disease:- an illness due to a specific infectious agent or its toxic products which arises through transmission of that agent or its products from an infected, animal or inanimate reservoir to a susceptible host, either directly or indirectly through an intermediate plant or animal host, vector, or inanimate environment.
- (c) Contact:- a person or animal that has been in association with an infected person or animal or a contaminated environment which might provide an opportunity to acquire the infective agent.
- (d) Contamination:- the presence of an infectious agent on a body surface, on or in clothes, bedding, toys, surgical instruments or dressings, or other inanimate articles or substances including water and food.
- (e) Endemic:- the constant presence of a disease or infectious agent within a given geographic area.
- (f) Epidemic:- the occurrence in a community or region of cases of an illness (or an outbreak) clearly in excess of expectancy.
- (g) Health education:- is the process by which individuals and groups of people learn to promote, maintain or restore health.



- (h) Host:- a person or other living animal, including birds and arthropods, that afford subsistence or lodgment to an infectious agent under natural (as opposed to experimental) conditions.
- (i) Incubation period:- the time interval between initial infection from an infectious agent and the appearance of the first sign or symptom of the disease in question.
- (j) Infectious agent:- an organism (virus, rickettsia, bacteria, fungus, protozoa and helminth) that is capable of producing infection or infectious disease.
- (k) Infestation:- for persons or animals the lodgment, development and reproduction of arthropods on the surface of the body or in the clothing.
- (l) Reservoir (of infectious agents):- any person, animal arthropod, plant, soil or substance (or combination of these) in which an infectious agent normally lives and multiplies, on which it depends primarily for survival, and where it reproduces itself in such manner that it can be transmitted to a susceptible host.
- (m) Susceptible:- a person or animal presumably not possessing sufficient resistance against a particular pathogenic agent to prevent contracting infection or disease if or when exposed to the agent.



(n) Suspect case:- a person whose medical history and symptoms suggest that he or she may have or be developing some communicable disease.

(o) Pathogenicity:- the capability of an infectious agent to cause disease in a susceptible host.

(p) Zoonosis:- an infection or infectious disease transmissible under natural conditions from vertebrate animals to man.

#### 1.7 STATEMENT OF HYPOTHESIS

Most of the hypotheses to follow hereunder are based on the lack of adequate information to suite the South African context of controlling the three diseases in question. The researcher has worked in the field of public health and has practically come across some difficulties in establishing the pattern of these diseases and others and their subsequent control.

The first hypothesis is that, while people are poor and do not have money, they fold their arms and expect the government to do everything in its power to prevent them from contracting these infectious diseases. This view is based on the perception people have towards the government concerning the infectious diseases. The perception being that the government must eradicate the diseases with its lots of money that is present in its coffers. The researcher has observed government employees protecting people from contracting particularly malaria fever while people

folded their arms and others refused even that offer.

The researcher further hypothesizes that most control measures against these diseases will be considered to be curative rather than preventive oriented. The researcher have observed government employees, for example, Health Inspectors who do not investigate and follow up typhoid cases after they have been notified by the hospitals about the prevalence of the disease. An investigation would help establish the possible source of infection and prevent further spread of the disease to other people in other areas.

The third hypothesis is that the environment which has been interfered with by humans is in turn determining the pattern of the spread of these diseases under the study. This investigation is intended to reveal people's ignorance concerning ways and means of safe guarding themselves against the environment which has been contaminated with diseases.

Lastly, it is hypothesized that people do not know control measures against the three diseases. An investigation like this will help establish those particular control measures that are unknown to people.

### 1.8 METHODOLOGY

The methods of obtaining, analysing, and presenting data in this study are broadly divided into three, namely:- the administration of questionnaires, the environmental observation and the field



work and sampling techniques.

### 1.8.1 Questionnaires

Questionnaires were administered by the researcher personally among, firstly, the KwaZulu government and the semi-government bodies engaged in the prevention of the spread of the three diseases. Secondly among those people whose areas have experienced these diseases.

The KwaZulu government officials that were interviewed are those engaged in curative and preventive medicine as well as the administrators of health programmes. A direct sample of twenty respondents was taken from these authorities in the study area. These authorities were expected to provide information that will prove the hypothesis right or wrong. It is through these hypotheses that the researcher envisages that a more curative medicine vis-a'-vis a preventive medicine would be revealed or exposed. Through these authorities one was also able to know whether or not the KwaZulu health department policies under which they work do influence the pattern of the diseases in the study area.

The people whose areas have experienced these diseases were interviewed by the researcher. A stratified random sample of sixty respondents was drawn from the study area. The inquiry was able to find out their perception regarding the control measures against these diseases.



### 1.8.2 Environmental observation

Control programmes against the spread of the three diseases were observed in loco by the researcher over a time period of three months. This observation was in order to detect the successes or failures of the programmes including:-

- (a) mosquito spraying against malaria fever;
- (b) snails control against bilharzia;
- (c) water spring protection or development, and
- (d) construction of pit latrines against typhoid fever.

### 1.8.3 Field work and sampling techniques

Twenty water samples were taken from natural water sources, for example, water spring, rivers, lakes etc. This sampling was taken for bacteriological analysis. This was to enable the researcher to establish the exact source of infection in the case of typhoid fever. In the case of bilharzia, 20 snails were trapped by the researcher and the officials from the institute of tropical diseases who in turn submitted these snails to their laboratory. The analysis of snails was to establish whether they were bilharzia carrying snails. In the case of malaria fever mosquitoes were trapped in twenty different places in the study area. This was done by the researcher together with officers from malaria offices situated at Jozini. The intention here was to identify these insects from the non-malaria caring mosquitos.

### 1.3.4 Analysis of data

The data was analysed with the aid of SAS programme of the computers in the department of geography of the University of Zululand.

### 1.9 CONCLUSION

Since humans invaded the environment and exploited it to their detriment, the result has been the eruption of various diseases. It should be the humans again who should bring about corrective measures to put right where the environment has been interfered with.



## CHAPTER 2

### THEORETICAL BACKGROUND

#### 2.1 INTRODUCTION

Medical geography coupled with public health is perceived by some academics as a new field and a part discipline of human geography. The new field brings some fears to certain critics as suggested by Lewis and Meyer (1988). The fears suggested are that this new field threatens the integrity, even the future of the human geography. The new field emerged during the end of small pox in the 1970s and the emergence of Acquired Immune Deficiency Syndrome (AIDS) (Cliff and Haggett, 1989). The two authors further write;

Both events (that is, small pox and aids) triggered renewed interest in disease eradication and the methods by which epidemics may be contained. Most of the new papers in this field over the seventies focus upon vaccine research and are clinically or laboratory related. But public health control programmes contain a spatial element which is of considerable geographical interest.

It is therefore concluded that public/environmental health is not as new as the discipline under which it falls. It has all along been grouped under one discipline of human geography.

## 2.2 AIMS

There are models in geography to determine the spread of the diseases. There are also procedures on medicine or public health for the control of the diseases. This chapter therefore aims at revealing:-

- (a) The relationship between geography, medicine and or Public Health studies.
- (b) The relationship between the environment and Health.
- (c) The relationship between the models and the disease occurrence.
- (d) Environmental control of the three diseases.

### 2.2.1 The Relationship between Geography, Medicine and or Public Health Studies

As enunciated in the introduction public health control programmes contain a spatial element which is of considerable geographical interest. This view is supported by Cliff and Haggett (1989) when they write that:

geographical research into medical and health fields (for example research on epidemic control and on natural hazard) could be sharpened to make a more efficient contribution to control programmes.

The control programmes of the three diseases under investigation have been stressed upon in chapter V. If geographical research into medical and public health fields (as quoted above) could be



enhanced, there could be other cure for the diseases either than medicine alone.

The study of geography becomes very important when one has to build the toilets to prevent the contamination of ground water with feacal bacteria. The geography of the area where there is a stream at a distance of 50m is not good enough for the construction of pit toilets. If pit toilets can be built next to the stream, there is a likelihood that infectious agents causing water borne diseases could seep into the stream to cause diseases in man. This paragraph clearly reveals the importance of knowing the studies of geography, medicine and public health and how they are intertwined.

The interwovenness in the study of the geography, medicine and public health is confirmed by Lewis and Mayer (1988) when they advise the academics to:

learn more about human response to stressors from parasites to extreme geo-physical events, and to increase the understanding of human-environment systems.

It is noted from the above quotation that geo-physical events and environmental systems have an impact on humans. Such impacts could cause humans to react negatively such that medicinal help could be sorted. It would appear from the above quotation that the authors thought of a humanistic approach to the study of geography. Such approach deals with the study of human beings and their totality, that is, including the study of geographical

set up in which humans live and to which they respond health wise and medical wise.

To further elaborate on this geo-medical relationship, Haggett (1983:298) looks at geographers and their interest in medicine.

He contends that:

Geographers are interested in the paths followed by epidemics, endemics and pandemics (M.V.N.) through the population of human settlement because of the insights they yield on other spatial diffusion processes.

It is learnt from the above quotation that the study of geography cannot be in isolation from other studies like medicine. It is believed again that medical people will not have a peace of mind without geographic assistance. These fields complement and need each other.

The diseases according to the above quotation can originate in few places but later spread over a much wider part of the world causing many side effects and multi disciplinary problems. The problems created by mortality cannot be overemphasized because, besides contributing to population decrease, they weaken the economy of the country, particularly if young and energetic men were to die.

It is believed that personnel in medicine, if they wish to halt, reduce or control the spread of the diseases, such geographic knowledge in this subsection may be helpful.



### 2.2.2 Relationship between the environment and health

Health matters take place in space. Accordingly health is directly or indirectly and positively or negatively influenced by the elements in the environment. The elements of the environment for example air, water, soil can harbour the disease infections or disease causative agents which will in turn directly or indirectly affect human beings. Tuberculosis is contracted by a direct contact with the air. Bilharzia is another example where a direct contact of humans with water infested with bilharzia parasites, is possible. Malaria is contracted through direct contact with an infected mosquito.

An indirect contact with the environment is evidenced when soil or flies contaminate food that is ingested by man. Man in this way gets infection. Typhoid can be contracted in this fashion or by direct contact with water contaminated with typhoid bacilli.

The environment affects health positively in that it harbours the bacteria that are necessary for decomposition of organic matter. Without these bacteria dead things would not decompose into simple inorganic materials which will be useful for life in the ecosystem.

The environment affects health negatively by harbouring pathogenic micro organisms which cause diseases in man.

Although the above-mentioned relationship is not discussed in great length by certain writers and academics quoted hereunder, this relationship cannot be ignored in the discussion of the control and pattern of the environmentally related diseases. The relationship is revealed by Gumbi (1987:60) where she writes that:-

Health is a state that enables individuals to function adequately, helps individuals adapt to their environment.

'Adaptation' as far as this research inquiry is concerned means that an individual will do things in the space for his own survival and such things should not adversely affect the environment.

The researcher shares the same idea as that of Meadows (1985:146) which states that man's continued exploitation of all forms of natural resources has affected the environment adversely. For example an individual may build a house with a high pitched roof on the windy area. Such roof will normally be blown away by wind. This means that individuals adaptation to the environment was for his own benefit. It was to the detriment of the environment, since the normal course taken by wind was blocked by the high pitched roof. A proper adaptation would be for an individual to construct a low pitched roof so that the blowing wind cannot be blocked.



Haggett (1983:237) confirms the issue of individual's adaptation as follows:-

By changing the face of the earth, building levees and dams, the potential threat of flooding is increased.

People pave the face of the earth for their own good only to find out that they are causing another problem from the environment they have altered.

The relationship between humans and the environment should be a harmonious and a healthy one, hence Gumbi (1987:159) concurs by arguing that "Health is a state of harmony between the individual and the environment." Gumbi (1987:104) further supports the harmonious relationship by stating the following:

The health status of a community is the result of the interaction between the biological characteristics of the people, factors in the environment, the lifestyle of the group and the health care system.

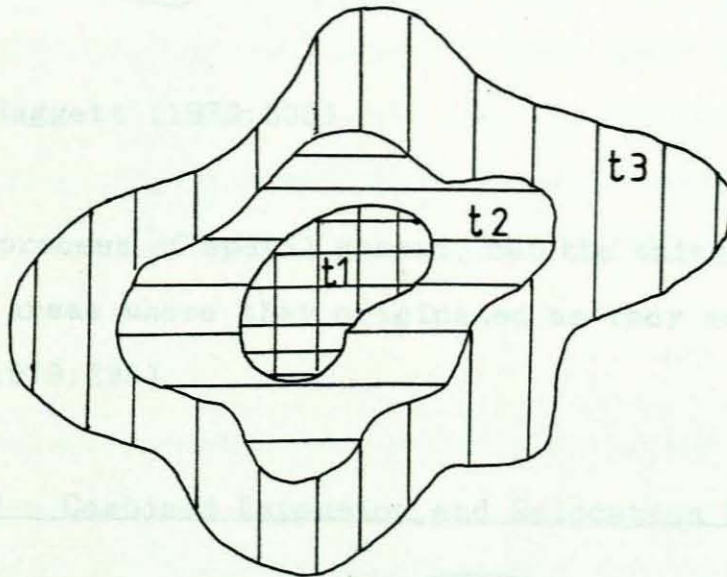
It is therefore hoped that, with a good harmony between the environment and humans, the health of individuals would not be at stake.

### 2.2.3 The relationship between the models and disease occurrence

This section looks at the three diffusion models by Haggett (1979:299) and how the diseases in the study area are associated

with these models. The models are namely the expansion diffusion, relocation diffusion and a combined expansion and relocation processes. (See fig. 2,1; 2,2 and 2,3 respectively on these models)

Figure 2.1 - Expansion Diffusion

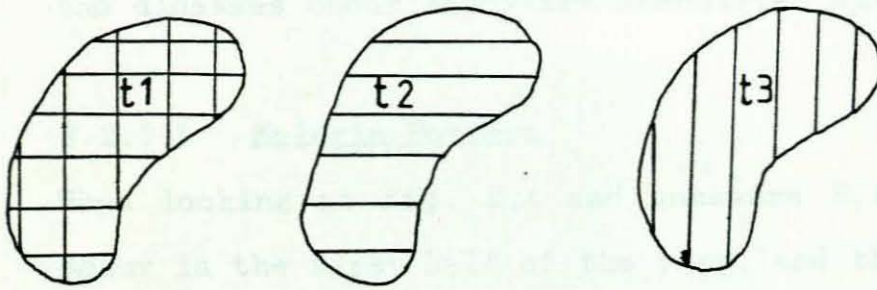


Source: Haggett (1979:300)

This is a process by which information, materials and so on, spread from one place to another. In this expansion process the things being diffused remain and intensify, in the originating region; that is, new areas are added between two time periods (time  $t_1$  and  $t_2$  are both located in the area that alters the spatial pattern as a whole). (Haggett, 1979:299)



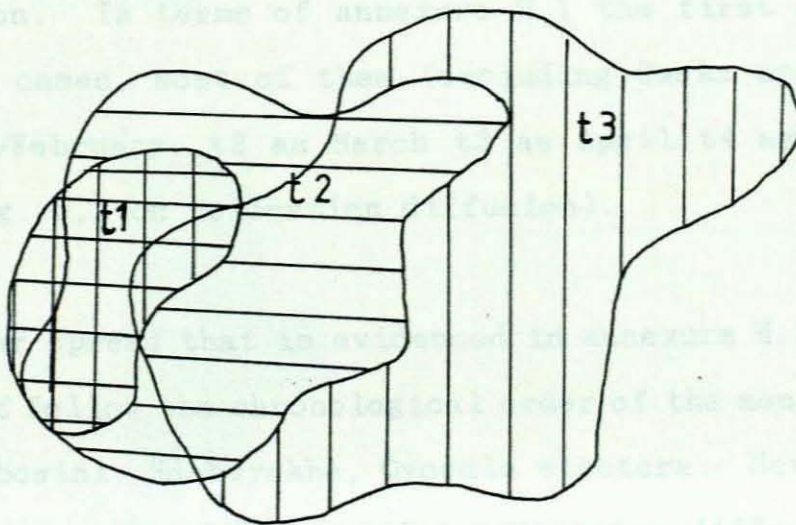
Figure 2.2 - Relocation Diffusion



Source: Haggett (1979:300)

A similar process of spatial spread, but the things being diffused leave the areas where they originated as they move to new areas (Haggett, 1979:299).

Figure 2.3 - Combined Expansion and Relocation Processes



Source: Haggett (1979:300)

This is a combination of two diffusions namely the expansion and relocation.

Having discussed the three diffusions the paper now looks at how the diseases under study are associated with these models.

#### 2.2.3.1 Malaria Pattern

When looking at fig. 2,4 and annexure H,1 most malaria cases occur in the first half of the year, and the second half of the year is free from malaria cases. Where there is a high incidence of malaria, cases occur on consecutive months from January/February to June/July. But where the incidence is low, cases do not occur following the chronological order of the months.

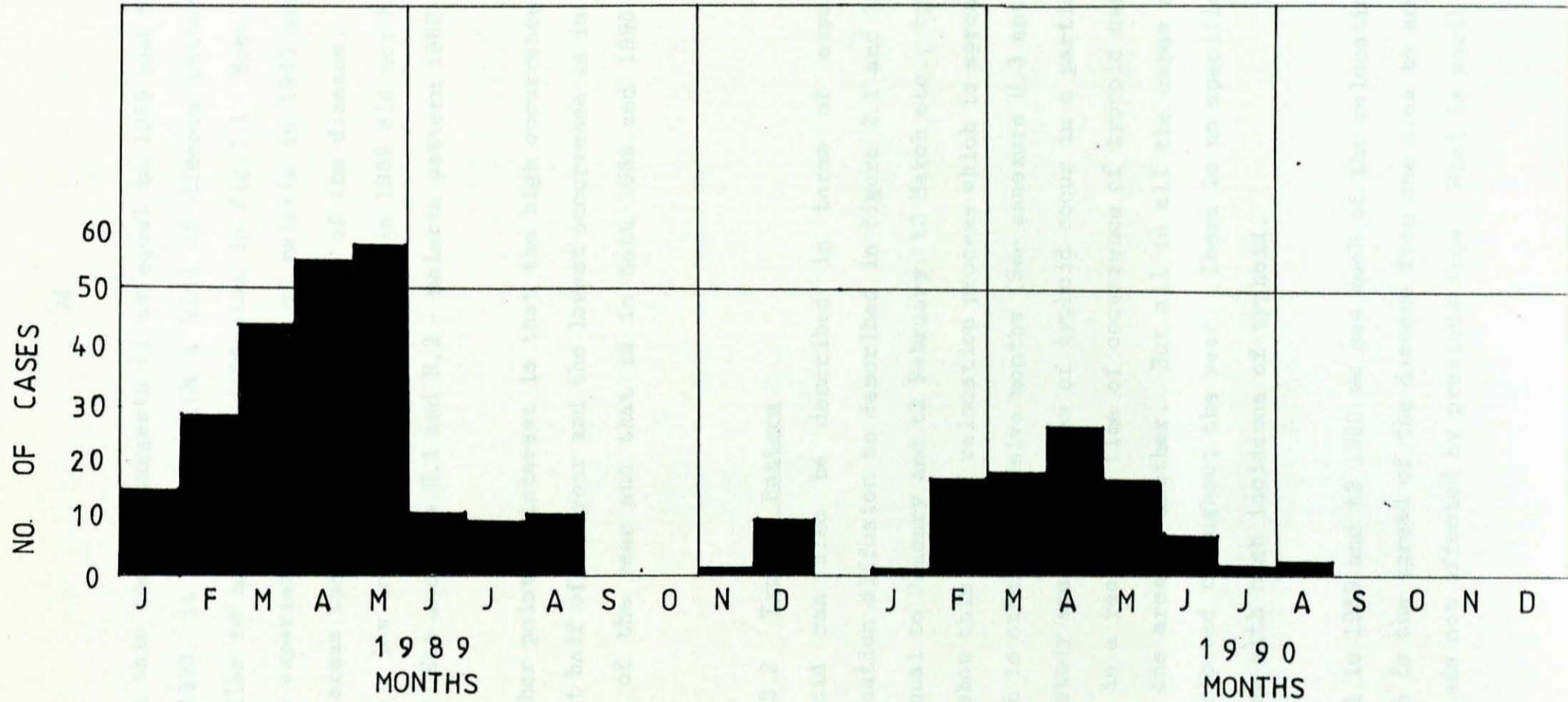
This kind of spreading of malaria following the order of the months can best be described in terms of the relocation diffusion. In terms of annexure H,1 the first six areas with malaria cases, most of them (excluding Cwaka area) have t1 as January/February, t2 as March t3 as April t4 as May/June (See also fig. 2,2 on relocation diffusion).

The other spread that is evidenced in annexure H,1 is that which does not follow the chronological order of the months for example at Nhlabosini, Ndabayakhe, Ovondlo etcetera. Nevertheless such a spread is also falling under relocation diffusion in that t1 can be March and t2 May.



Fig. 2.4

# MALARIA CASES IN ONGOYE REGION (1989/90)



SCALE : 1mm = 1 CASE

When this inquiry suggests  $t_1$  as equal to 1989 and  $t_2$  as equal to 1990, it comes up with a kind of disease pattern that is similar to an expansion diffusion in fig.2.1 Most areas that have experienced the incidence of malaria in 1989 and 1990 are the areas that had a high incidence of the disease. Most areas with a low incidence of the disease in 1989 did not have any in 1990 (See annexure H,1 and H,2 - malaria pattern 1989 and 1990).

Another point of interest is that the high occurrence is in the first half of the year and the lowest occurrence is in the second half of the year and that is in both 1989 and 1990 (see fig. 2,4).

#### 2.2.3.2 Typhoid Pattern

Typhoid can also be described in terms of expansion and relocation diffusion as described in figure 2,1 and 2,2. If  $t_1$  is equal to January and  $t_2$  February,  $t_3$  March etc., typhoid does not show this type of relocation process which is spread from one month to other successive months (See annexure H,3 and H,4). In the study area, the cases of typhoid occur in a particular area once in a year. The time of occurrence of typhoid cases differ from one area to another. But all in all the cases are fairly distributed throughout the year. There is no specific month or months with high incidence of typhoid.

If  $t_1$  is 1989 and  $t_2$  1990 we see much of the relocation process which is the spread of the disease from one area to another area that was not affected by previous area. What is worth noting is



that the highest occurrence in both 1989 and 1990 (in fig. 2,5) is in the first half of the year and the lowest occurrence is in the second half of the year.

FIG. 2.5  
TYPHOID CASES IN ONGOYE REGION (1989/90)

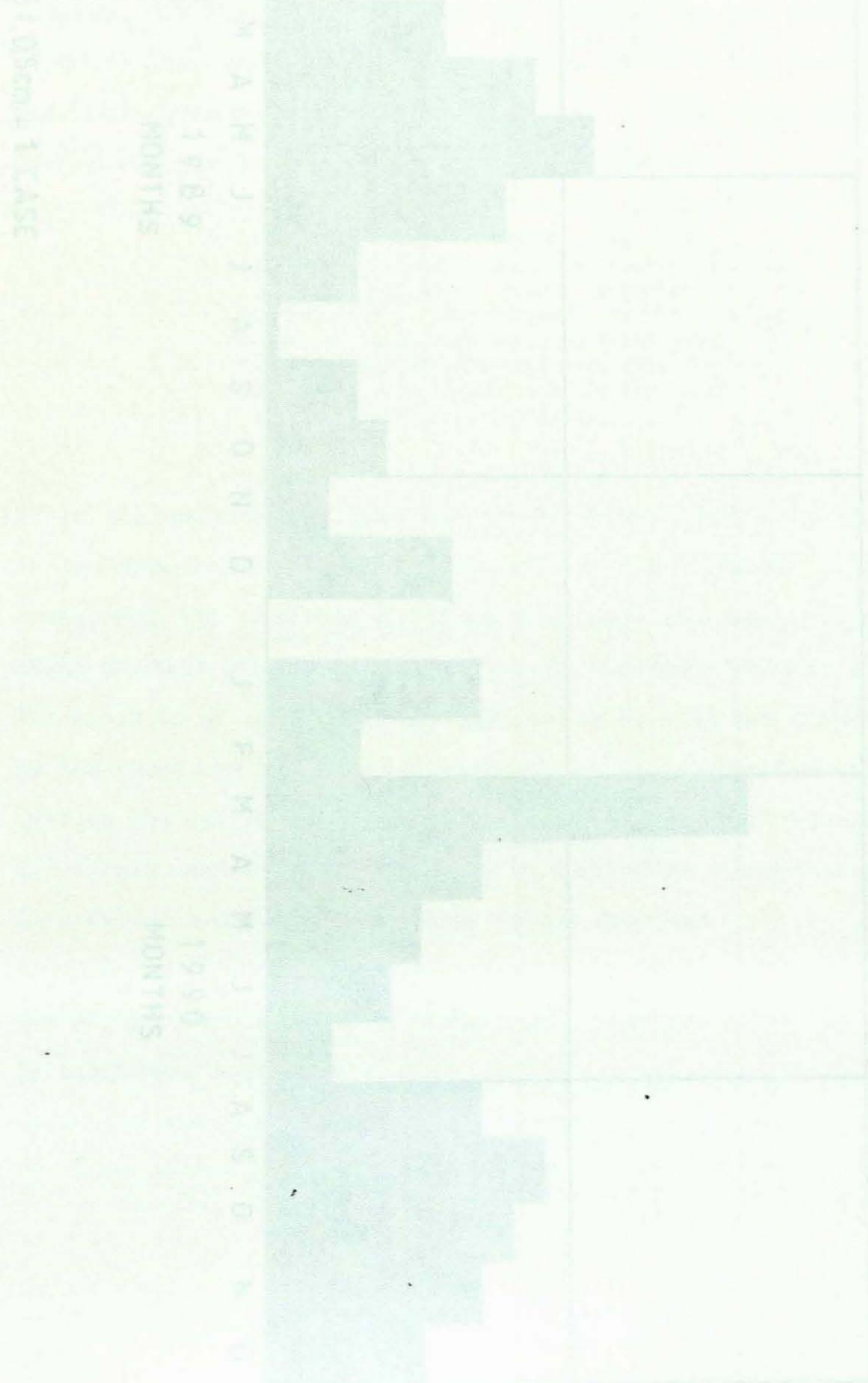
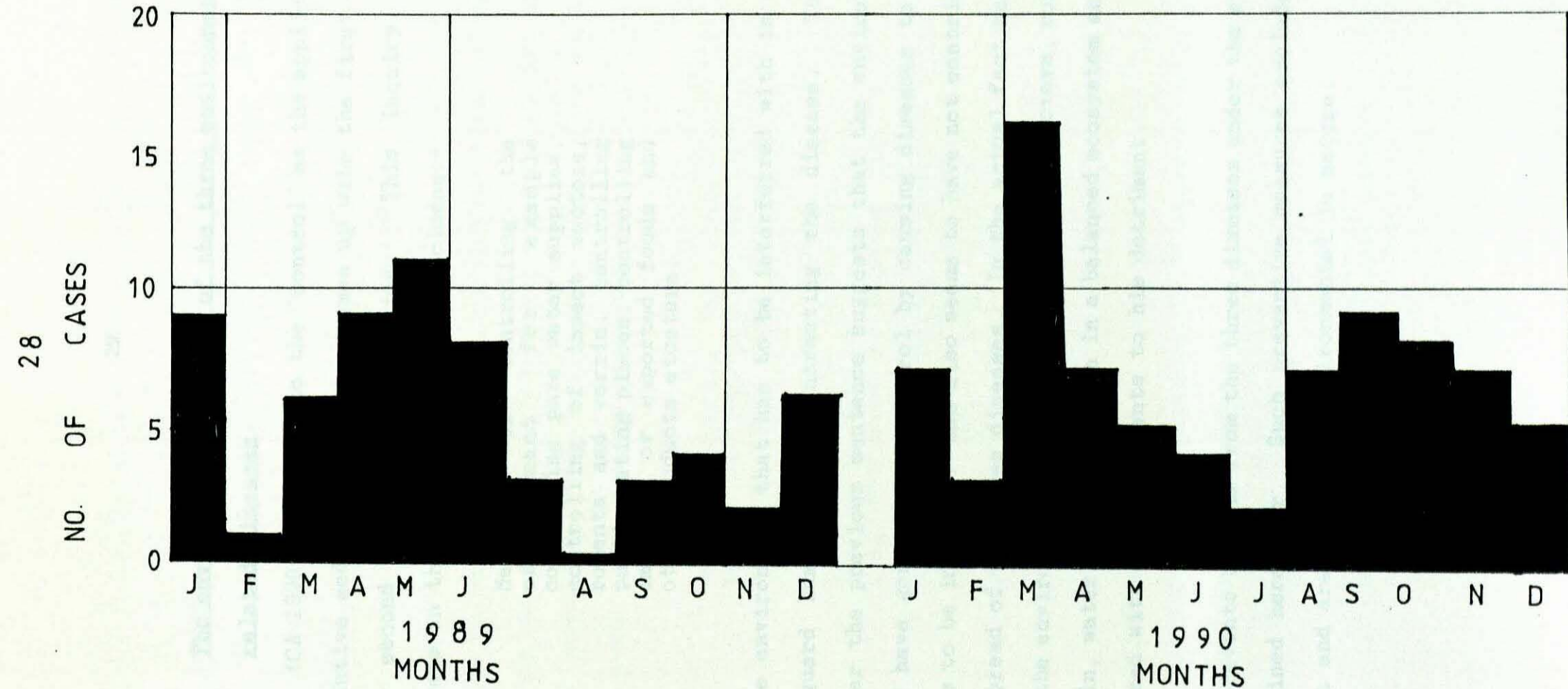


Fig. 2.5

TYPHOID CASES IN ONGOYE REGION (1989/90)



SCALE : 0,5cm. = 1 CASE



#### 2.2.4 The environmental control of the three environmentally related diseases

Kassner, (CA 1990:12) refers to the 'control' as the application of preventive medicine. Kassner comes up with the first level and the second level of prevention. This inquiry shall concentrate on the first level which includes:-

Measures of controlling the environment for example controlling pure water supplies, controlling of insect vectors, rodents and vermin, controlling public eating places, controlling imported or exported foods and other products etcetera.

It is the environment that has to be interfered with in order to safeguard humans from contracting the disease. To the researcher the previous sentence suggests that the environment seems to have gone out of control by causing diseases to man. Man seems to be innocent. Man also seems to have not contributed to the spread of the three diseases. In the actual fact man has invaded the environment together with its insect vectors, rodents and vermin, water, soils etcetera in a balanced ecosystem and has interfered with those elements to his detriment.

How man prevents himself from the three diseases under the study, is explained hereunder. Such preventive measures exclude the treatment and are basically environmental in nature.

#### 2.2.4.1 Malaria control

Kassner, (Ca 1990:101) and Benenson (1970) agree that people should be advised about the prevention and elimination of mosquitoes in their habitat and breeding places. People should also be encouraged on good housekeeping by preventing accumulation of articles where water can collect and allow mosquitoes to breed. This includes regular inspection of gutters and drains and wearing of protective clothing or the use of mosquito repellants when leaving the house after sunset in endemic areas. Both authors postulate:

The destruction of mosquito larvae by spraying surface of water in dams, tanks and swamps with a paraffin solution which will cause the larvae to suffocate. The protection of houses in endemic areas with mosquito gauze on windows and doors and with mosquito nets over beds. The construction of houses at approximately 8-9 kms away from the rivers, dams or swamps in endemic areas and the introduction of 'Tilapia' fish in dams or rivers to eat the larvae.

#### 2.2.4.2 Typhoid control

Kassner (Ca 1990:167) and Benenson (1970) agree on the following environmental control measures:-

The need for satisfactory sanitary measures including the prevention of contamination of food, milk, and water with human excreta or urine. Control or inspection of food handlers. Prevention of fly infestation. Washing of vegetables and fruit well in purified water. Avoiding



eating of shell fish from contaminated rivers and streams. Boiling, pasteurization or sterilization of milk.

#### 2.2.4.3 Bilharzia (schistosomiasis) control

Kassner (Ca 1990:50) explains that the health authorities believe that the main prevention lies in the treatment of infected cases. In revealing the factors that can help control the spread of their disease, he agrees with Gear and Pitchford (Ca 1980:27-34) on the following:

The protection of people who are exposed to the danger of contamination by wearing rubber boots and gloves, and drying themselves well with a towel after contact with contaminated water. The provision of safe swimming facilities for children for example tanks which can be easily cleaned and kept free from snails, but the water must come from a safe source, or be filtered and chemically treated before use. If no piped water is available, water from the rivers, ponds or dams can be used for washing (clothing, utensils, bathing) provided the water is left to stand for a 48 hours. Drinking water must first be purified before it is used.

### 2.3 CONCLUSION

It is these control measures on which people in the study area have been tested to find out their responses" in chapter IV. It has been hypothesized in chapter 1 that the respondents neither know these control measures nor practise them. Some further preventive measures are those that have been seen by the

researcher during data collection through field observation in chapter IV.

### THE PHYSICAL SETTING

With the geographic analysis of the disease pattern and with the control measures known by the communities, these two could form the basis on which planning could be done. Planning could be done by the engagement of government authorities and interested parties for the prevention and control of the disease before and after it had struck the communities.

It is assumed therefore that if all people together with the health workers in the study area could strictly adhere to the control measures just mentioned, there could be no existing pattern of the three diseases under the study.



## CHAPTER 3

### THE PHYSICAL SETTING

#### 3.1 INTRODUCTION

The physical set up of this research report is divided into the physical features, the 1989/1990 statistical data and pattern and control of the three diseases within the study area. The physical features alone, could not give the physical outlook and appearance of the study area as far as the three diseases are concerned. It was for this reason that this research inquiry includes in this chapter the statistical outlook, pattern and control outlook of the study area.

Over and above the above-mentioned information, physical features, contribute in one way or other to the pattern and control of the three diseases. For example, the rivers, lakes, springs and other water bodies play a major role in the spread of the three diseases: in that typhoid is acquired through ingestion of contaminated water, bilharzia is acquired through skin contact with contaminated water and malaria is acquired through the bite of a mosquito which harbours in water. Another example is that the hospitals and clinics found in the study area play a major role in keeping the disease incidences down. Even the climate of the area seems conducive to the causative agents of the three diseases.

It is these clinics and hospitals which notify health authorities about the prevalence of the three diseases. It is also these institutions which

### 3.2 THE PHYSICAL FEATURES

The physical features are subdivided into the climatic and the non-climatic features. The climatic features have been included for their contribution in the spread of the three diseases. The rainfall, floods, drought, temperature, have a bearing in the distribution and pattern of the three diseases. The non-climatic features have also been included in this study for their relationship in the occurrence of the three diseases as discussed under each subtopic hereunder.

#### 3.2.1 The non-climatic features

The non-climatic features to be discussed are hospitals, rivers, towns, recreational facilities, educational facilities and tribal authorities. This paragraph must be read in conjunction with a map in fig 3.1 and annexure C.1.

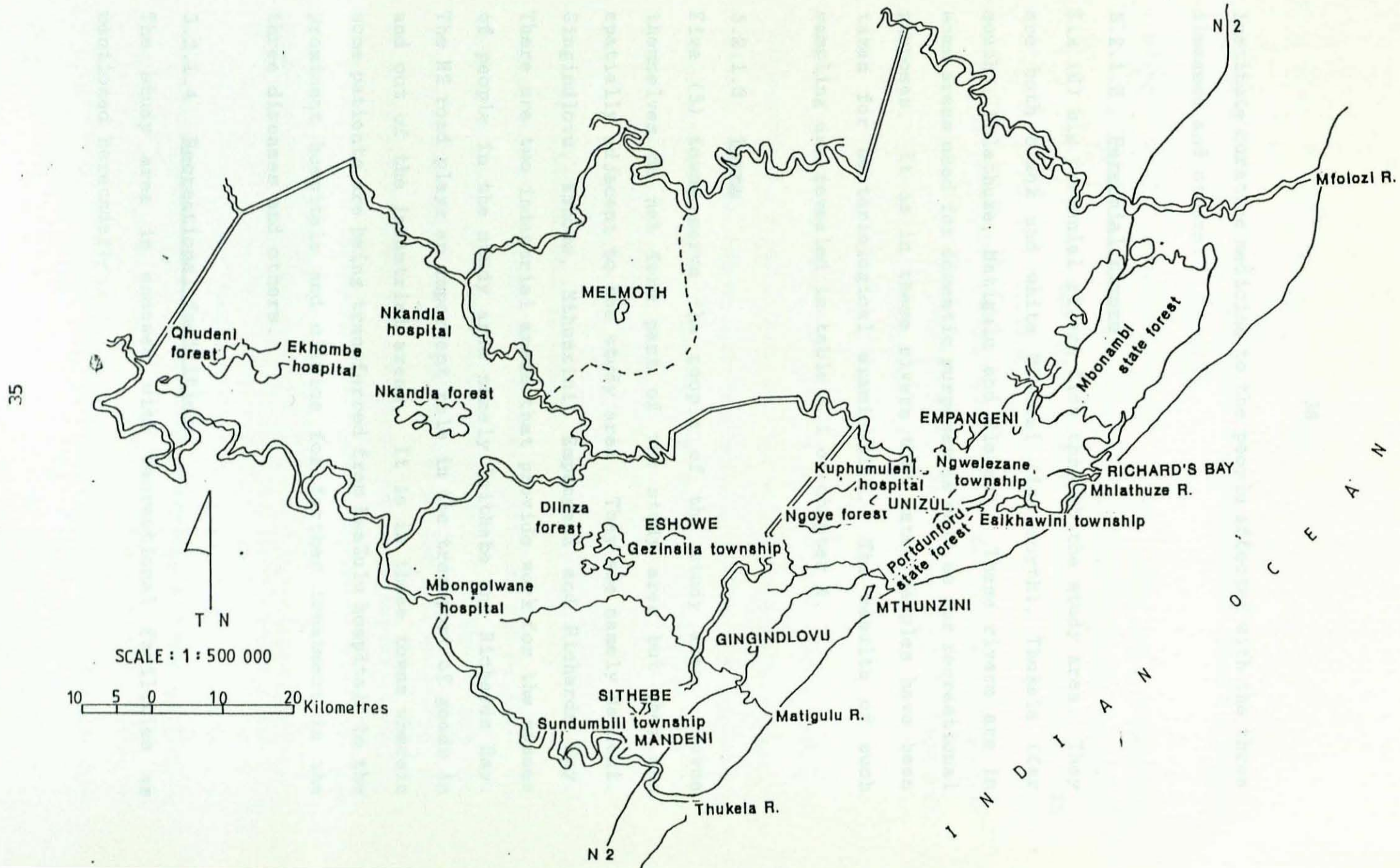
##### 3.2.1.1 Hospitals

The study area is served by six (6) hospitals run by the KwaZulu government. There are two hospitals from each district. The largest hospital being Ngwelezane is situated in the Enseleni district. Hospitals alone cannot cater adequately for the population in the study area. They work in close conjunction with the clinics that are situated in walkable distances from the people's residential areas. Nkandla district has nine clinics, Inkanyezi district has eight (8), Enseleni district has ten (10) and Ongoye district has six (6) clinics. It is these clinics and hospitals which notify health authorities about the prevalence of the three diseases. It is also these institutions which



Fig 3.1

SOME PHYSICAL FEATURES IN THE STUDY AREA.



institute curative medicine to the people affected with the three diseases and others.

#### 3.2.1.2 Perennial rivers

Six (6) big perennial rivers flow through the study area. They are both black and white Mfolozi (far north), Thukela (far south), Mhlathuze, Matigulu and Mlalazi. These rivers are in some areas used for domestic purposes as well as for recreational purposes. It is in these rivers that water samples have been taken for bacteriological examination. The results of such sampling are revealed in table 4.1 of chapter 4.

#### 3.2.1.3 Towns

Five (5) towns serve the people of the study area. Towns themselves do not form part of the study area but they are spatially adjacent to the study area. They are namely Mandeni, Gingindlovu, Eshowe, Mthunzini, Empangeni and Richards Bay. There are two industrial areas that provide work for the masses of people in the study area namely Isithebe and Richards Bay. The N2 road plays an important role in the transport of goods in and out of the industrial areas. It is in these towns wherein some patients are being transferred from KwaZulu hospitals to the prominent hospitals and clinics for further treatment in the three diseases and others.

#### 3.2.1.4 Recreational facilities

The study area is endowed with recreational facilities as mentioned hereunder:-



Forests:- natural forests are Nkandla, Qhudeneni, Ongoye and Dlinza.

Lakes:- Cubhu lake which supplies Esikhawini township and Nsezi which supplies Empangeni borough. Other lakes are Mzingazi and Nhlababo.

Ocean and beaches:- Indian ocean has the following beaches Richards Bay, Esikhawini, Port Dunford and Mthunzini.

It is in the forests that people in the study area defecate indiscriminately and contaminate the soil with disease causative agents. Lakes, oceans and beaches are related to swampiness which are suitable environments for harbouring malaria carrying mosquitoes and bilharzia carrying snails.

#### 3.2.1.5 Educational facilities

Educational facilities are distributed all over the region in the form of primary, secondary and high schools. On top of that, the region is fortunate for having two (2) colleges of education, one at Gezinsila township and the other one at Esikhawini township. There is also an agricultural college situated as Cwaka area and a university situated at Kwa-Dlangezwa area.

It is believed that these institutions do conduct subject or courses on either medical geography, environmental health, health education or epidemiology. These subjects/courses help in acquiring vast knowledge of the control of diseases particularly

the environmentally related diseases.

#### 3.2.1.6 Tribal authorities

Each district consists of tribal authorities with the chief (inkosi) as a head of the tribal authority. In Inkanyezi district there are thirteen (13) tribal authorities, (19) in Nkandla, (11) Enseleni and six (6) Ongoye. Each tribal authority has its court where criminal and civil cases are tried and where the day-to-day administration of the tribe is conducted. All reported cases of the three diseases from rural areas actually come from the tribal authorities. It is the tribal authorities structures that are capable of taking resolution concerning those people who do not want to adhere to the control measures against the three diseases.

#### 3.2.2 The climatic features

The main items included in this section are the impact of floods and drought in the spread of the three environmentally related diseases.

Gumbi (1987) agrees with Keyter (1991,1992) that South Africa is located on the subtropical location on either side of 30 S, which accounts for the warm temperate and rainy conditions so typical of the study area. Rainfall is mainly in summer months. The highest rainfall occurs close to the sea. Daily temperatures are usually influenced by latitude, distance from the sea and altitude.

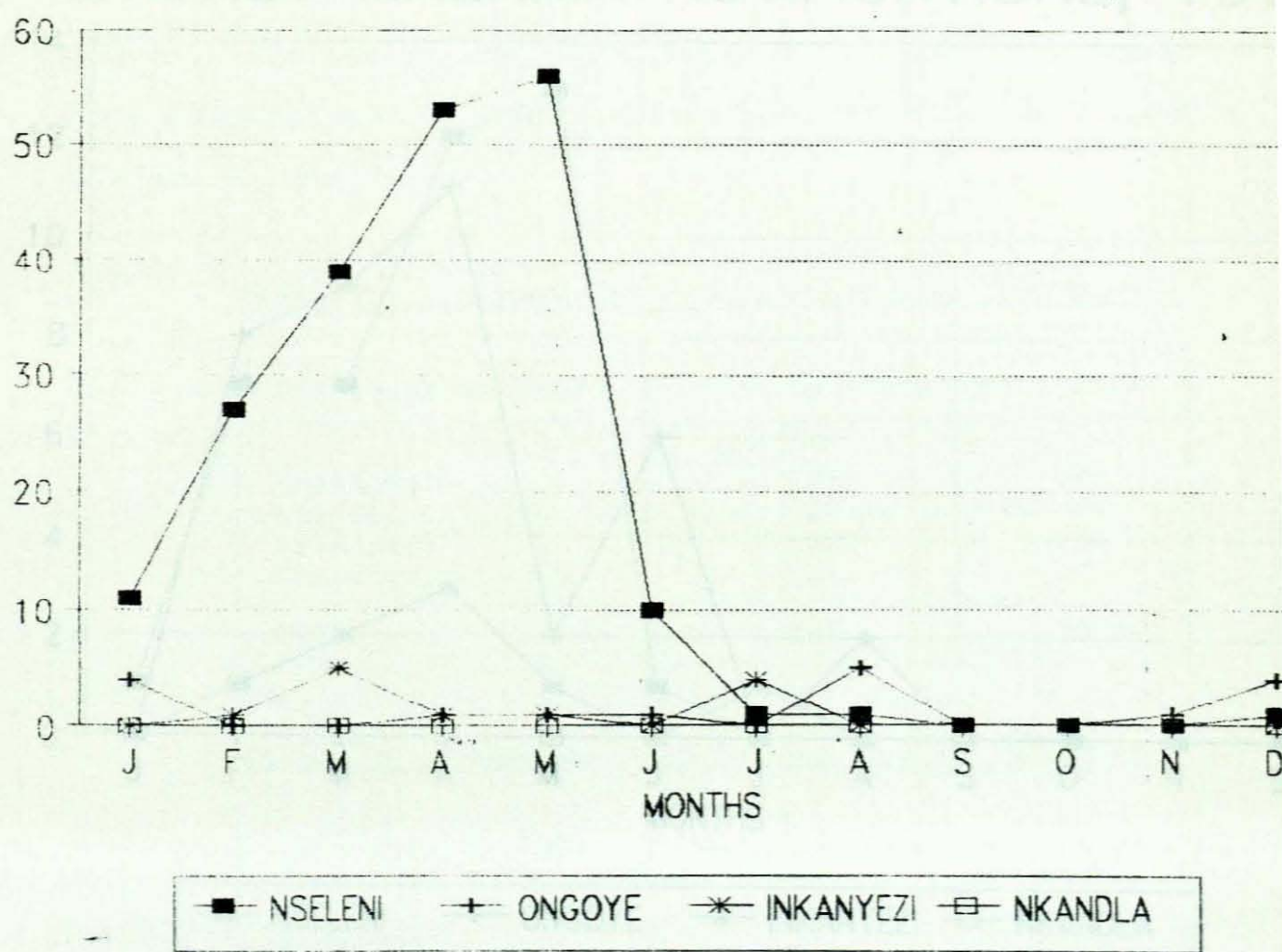


The study area has a tendency of high rainfall resulting in floods which destroy property, crops and even loss of life (Knapp,1986). Such flooding as caused Domoina and Imboa in 1983/4 was typical of study area. With the run-off from the mountains dragging along disease infectious agents, contaminate the water body which is in turn used by the public for domestic purposes. Such contamination causes gastro-intestinal and water borne diseases for example typhoid fever and probably schistosomiasis (bilharzia). After flooding, pools of water on the ground surface become the ideal breeding places for mosquitoes which will in turn spread malaria fever to humans.

Similar to the flood effects is the drought impact on environmental health. Although the study area is not that much prone to droughts, it is stated that from Cape to Cairo, Africa is suffering one of its most devastating droughts in living memory and weathermen say worse may be to come (cf. The Natal Mercury,1992:7).

Under dry conditions or prolonged drought conditions, lower rates of run off can cause stagnation and less dilution effects, thereby increasing the likelihood of microbiological activity (Pontius,1990:195). It is through these conditions that the rate of water borne diseases like typhoid escalate during drought seasons than it is during normal seasons.

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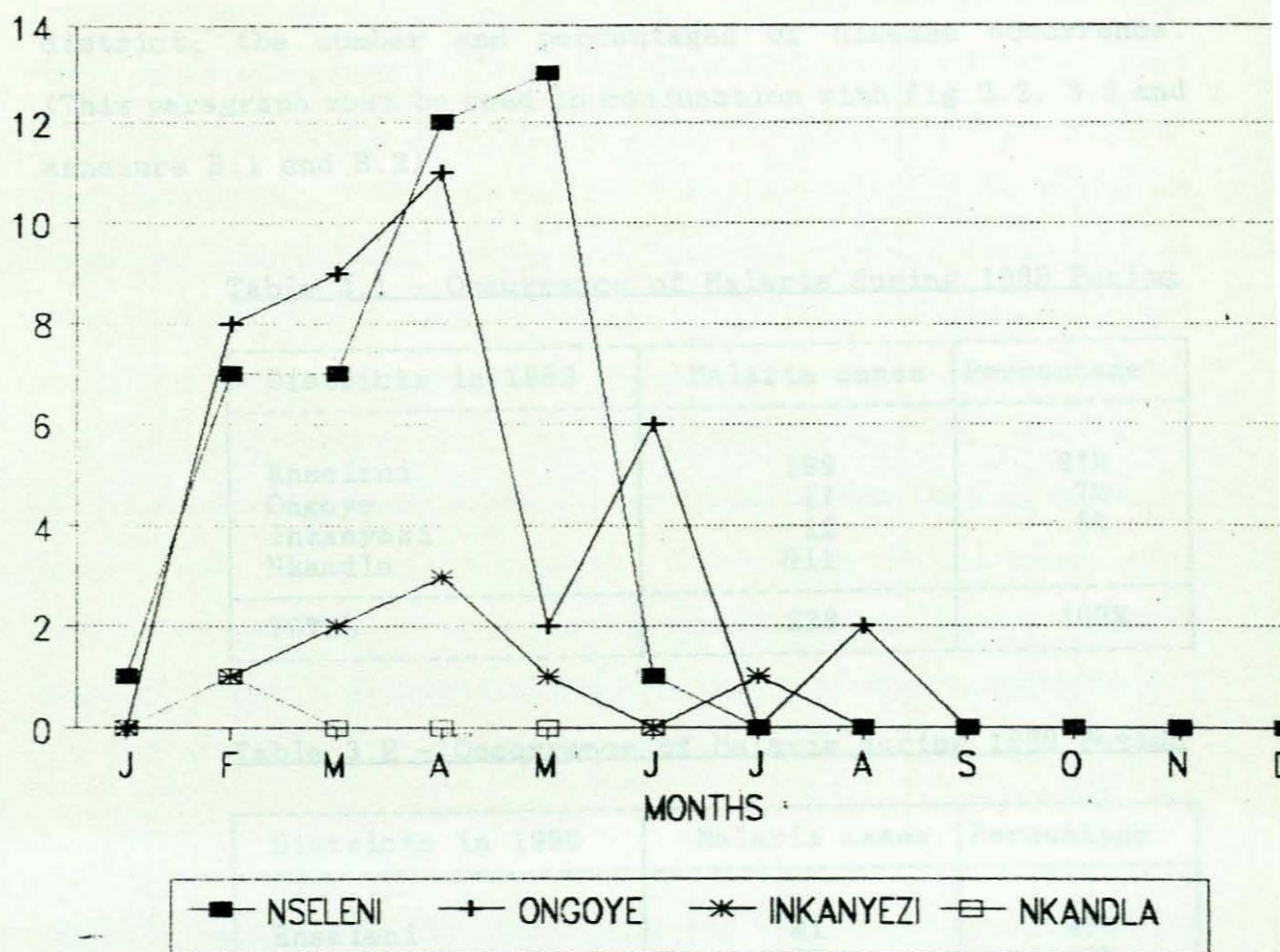




## STATISTICAL INFORMATION IN THE STUDY AREA

The statistical information on the occurrence of the three diseases was collected from the offices of environmental health. These offices are situated at Ngwenyane and at Jozini and are responsible for the control of the three diseases under study.

## MONTHLY MALARIA NOTIFICATIONS; 1990



### 3.3 STATISTICAL INFORMATION IN THE STUDY AREA

The statistical information on the occurrence of the three diseases was collected from the offices of environmental health. These offices are situated at Ngwelezane and in Jozini and are responsible for the control of the three diseases under study.

#### 3.3.1 Malaria

The statistical information collected includes the year, the district, the number and percentages of disease occurrence. (This paragraph must be read in conjunction with fig.3.2, 3.3 and annexure B.1 and B.2)

Table 3.1 - Occurrence of Malaria during 1989 Period

| Districts in 1989 | Malaria cases | Percentage |
|-------------------|---------------|------------|
| Enseleni          | 199           | 87%        |
| Ongoye            | 17            | 7%         |
| Inkanyezi         | 12            | 5%         |
| Nkandla           | Nil           |            |
| TOTAL             | 228           | 100%       |

Table 3.2 - Occurrence of Malaria during 1990 Period

| Districts in 1990 | Malaria cases | Percentage |
|-------------------|---------------|------------|
| Enseleni          | 41            | 47%        |
| Ongoye            | 38            | 43%        |
| Inkanyezi         | 8             | 9%         |
| Nkandla           | 1             | 1%         |
| TOTAL             | 88            | 100%       |



The origin of malaria cases in the study area were reported from the areas of the above tabled districts. These areas are indicated in annexure B.1 and B.2. Most of these areas wherein malaria have been reported are situated towards the coastal belt stretching from the Thukela river towards the northern boundary which is Umfolozi river. Our conversation with the Public Health Officer from Jozini, who is responsible for malaria control, revealed that under normal circumstances few cases have been reported beyond the Thukela river. The officer reported that most cases are reported from Thukela river beyond the study area further north to Hlabisa, Ubombo, Ingwavuma districts, Swaziland and Mozambique. He assured me that the cases that might be reported beyond Thukela river are imported cases, that is, people who come to these areas already sick. This has been the case with the one case reported at Nkandla district (See table 3.2). The officer further told me that because of the absence of malaria carrying mosquitoes, there is no chance that an infected person can infect other people. The places in the study area that consist of malaria carrying mosquitoes are those situated east of Melmoth, Eshowe and Mandeni (see the map in annexure B.2 on the distribution of malaria cases).

So far most cases have been reported in the vicinity of Empangeni and its neighbourhood. The cause for this high incidence near Empangeni could be that, Empangeni is the nearest big town (with Richards Bay industrial centre) in Natal from Mozambique for the Mozambiquans to come and settle. The Mozambiquans come in search of work not knowing that they harbour the disease and most of

them enter into South Africa illegally. Because of the presence of malaria carrying mosquitoes, such mosquitoes suck the blood of infected persons and spread the infection by introducing the blood into a normal person through its bite.

As shown in table 3.1 and 3.2 that for the whole region malaria cases have decreased from 228 in 1989 to 88 in 1990. But it is as well worth noting that some districts in the same region have experienced an increase in the number of cases. Ongoye district have the cases raised from 17 to 38 and Nkandla district where there was no case, have had a case.

### 3.3.2 Typhoid

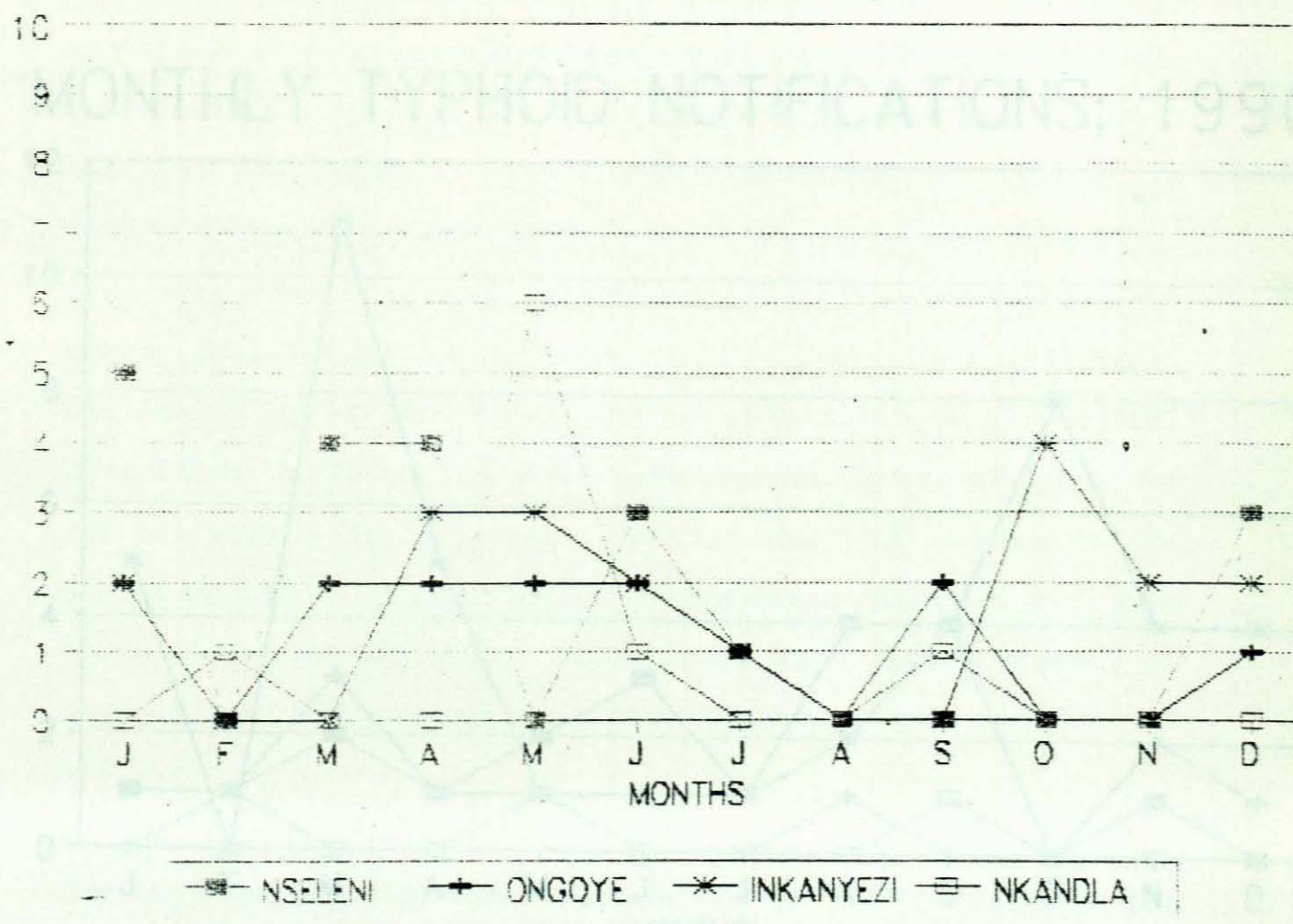
The following 1989-1990 typhoid statistics include the year, district, number and percentage of disease occurrence. (This paragraph must be read in conjunction with fig.3.4 and 3.5 and annexure B.1 and B.2)

Table 3.3 - Occurrence of Typhoid during 1989 Period

| Districts in 1989 | Typhoid cases | Percentage |
|-------------------|---------------|------------|
| Enseleni          | 20            | 32%        |
| Ongoye            | 14            | 23%        |
| Inkanyezi         | 19            | 31%        |
| Nkandla           | 9             | 14%        |
| TOTAL             | 62            | 100%       |



## MONTHLY TYPHOID NOTIFICATIONS; 1989



## MONTHLY TYPHOID NOTIFICATIONS; 1990

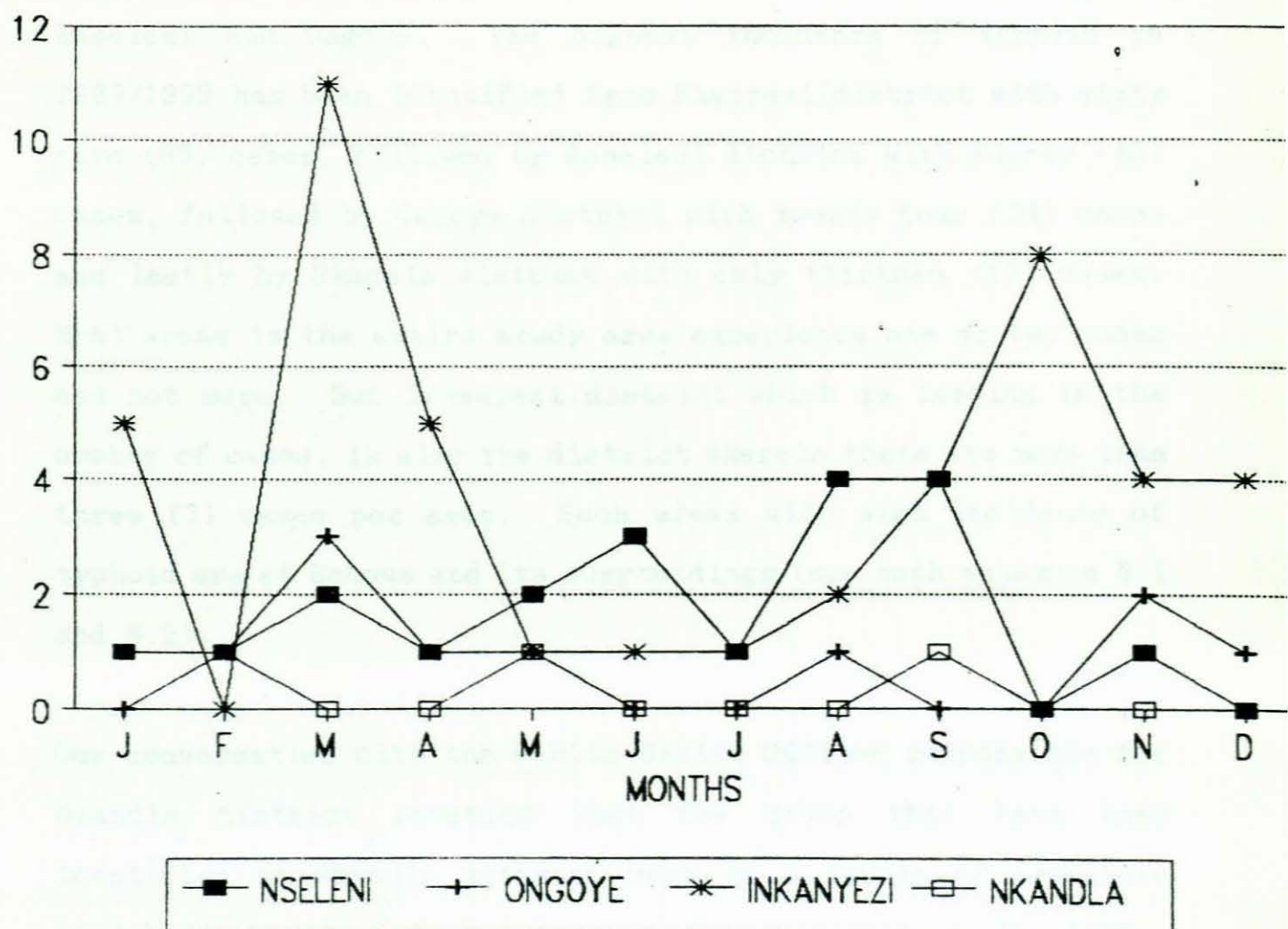




Table 3.4 - Occurrence of Typhoid during 1990

| Districts in 1990 | Typhoid cases | Percentage |
|-------------------|---------------|------------|
| Enseleni          | 20            | 25%        |
| Ongoye            | 10            | 12%        |
| Inkanyezi         | 46            | 58%        |
| Nkandla           | 4             | 5%         |
| TOTAL             | 80            | 100%       |

When one looks at the origin of typhoid cases in the map on annexure B.2, one sees a distribution of cases all over the study area which are the four (4) districts namely Inkanyezi, Nkandla, Enseleni and Ongoye. The highest incidence of typhoid in 1989/1990 has been identified from Nkanyezi district with sixty five (65) cases, followed by Enseleni district with forty (40) cases, followed by Ongoye district with twenty four (24) cases and lastly by Nkandla district with only thirteen (13) cases. Most areas in the entire study area experience one or two cases and not more. But Inkanyezi district which is leading in the number of cases, is also the district wherein there are more than three (3) cases per area. Such areas with high incidence of typhoid are at Eshowe and its surroundings (see both annexure B.1 and B.2).

Our conversation with the Public Health Officer responsible for Nkandla district revealed that few cases that have been identified at Nkandla district were as a result of extensive health education conducted during cholera epidemic in the 1980s. Again, people in this area no longer solely depend on ground

water for portable water, but were supplied with almost enough boreholes during the cholera epidemic. The same people were also educated in the water spring development. Nkandla district was badly hit by cholera outbreak. This had helped Nkandla district residents to acquire water facilities that not only prevented them from cholera but also from all water-borne and gastrointestinal diseases like typhoid.

As shown in table 3.3 and 3.4 above, typhoid cases have increased from 62 in 1989 to 80 in 1990. But if one looks at individual districts one sees that in three districts there was an overall decrease in the number of cases in 1990. It was only Inkanyezi district that had a large increase in the number of cases. Even if the three districts have experienced a decrease in the number of cases, one district, because of its increase in the number of cases, have influenced the overall position of the region.

### 3.3.3 Schistosomiasis / Bilharzia

This disease is not a notifiable medical condition and people have stayed with the disease untreated until the parasites have migrated into the liver and other parts of the body to cause either hepatic or other complications other than schistosomiasis. In this case it is difficult to establish the source of infection which is water that has been infested with schistosomiasis parasites. It is again difficult to prevent further spread of the disease if the source of infection cannot be established. (Gear and Pitchford, Ca 1980)



What normally occurs is that when the school health nurses do their normal school visits and come across cases of schistosomiasis, it is then that the river that is infested with the parasites can be established and control measures be taken to prevent the community from further contracting the disease.

During the years 1989 and 1990 the pattern of this disease could not be established as some of the records were missing since the hospitals in the study area are not legally obliged to keep such records on the occurrence of the disease as this disease does not fall under those that are notifiable. It is even more difficult to know the areas with occurrence of this disease. According to Kassner (1990:45) all rivers flowing into the Indian ocean are infested with schistosomiasis parasites. One can therefore conclude that all places through which these rivers flow, have cases of bilharzia.

### 3.4 CONCLUSION

This chapter has revealed the relationship between the physical features and the prevalence, pattern and control of the three diseases under study. Both natural physical features like the rivers and artificial physical features like the hospitals influence the prevalence of the three diseases.

## CHAPTER 4

### FINDINGS

#### 4.1 INTRODUCTION

The findings of this investigation are in two folds: that is, findings as a result of both fieldwork observation and questionnaire data collection, as well as computer processing are presented. It is also important to note that analysis of data is presented in such a manner that interpretation is entered into at the same time.

#### 4.2 FIELDWORK OBSERVATION RESULTS

The environmental relatedness of these three diseases have had to be looked at in terms of what eventually happens to the environment, in an effort to decrease the spread of the three diseases. In observing the field and generating some data base or findings, a methodological procedure that was taken up was firstly to detect the successes or failures of the environmental programmes. The said environmental programmes include:-

- (a) mosquito spraying against malaria;
- (b) snails control against bilharzia;
- (c) water spring protection, ferro-cement tank construction and well construction for controlling both typhoid and bilharzia; and
- (d) the construction of ventilated improved pit latrines (VIP) for the control of typhoid and bilharzia.



A methodological procedure that was taken up was secondly to establish the source of infection for typhoid (from water sampling) and to detect the malaria carrying mosquitoes and the bilharzia carrying snails from the non disease carrying organisms.

#### 4.2.1 Typhoid field observation results

Water sampling from 30 rivers was collected and taken to Ngwelezane laboratory to identify the salmonella typhi bacillus (S.typhi) which causes typhoid fever. The following rivers which run through the four districts in the study area, were sampled and the results are shown in table 4.1

Table 4.1: River Water Sampling by Districts

| District  | Name of river | Sampling results per 100 mls of 1:10 dilution    |
|-----------|---------------|--------------------------------------------------|
| Inkanyezi | Thukela       | 5 colonies X 10 = 50 colonies of S.typhi         |
|           | Mamba         | the river had dried up                           |
|           | Matigulu      | 8 colonies X 10 = 80 colonies of S.typhi         |
|           | Nembe         | 1 colony X 10 = 10 colonies of s.typhi           |
|           | Mpushini      | the river had dried up                           |
|           | Mlalazi       | 5 colonies X 10 = 50 colonies of s. typhi        |
|           | Mhlathuze     | no salmonella typhi isolated                     |
| Ongoye    | Mvuzana       | the river had dried up                           |
|           | Vuma          | the river had dried up                           |
|           | Matigulu      | 6 colonies X 10 = 60 colonies of S . t y p h i . |
|           | Mlalazi,      | 7 colonies X 10 = 70 colonies of s.typhi         |
|           | Mhlathuzana   | the river had dried up                           |
|           | Mhlathuze     | no salmonella typhi isolated                     |
|           | Mzingwenya    | 10 colonies X 10 = 100 colonies of s.typhi       |

|          |                                                      |                                                                                                                                            |
|----------|------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| Enseleni | Mhlathuze<br>Nseleni<br>Msunduze                     | no salmonella typhi isolated<br>no salmonella typhi isolated<br>6 colonies X 10 = 60 colonies of<br>s.typhi                                |
|          | Mvamanzi<br>Okula<br>Mfule<br>Mvunywana<br>KwaMazula | no salmonella typhi isolated<br>no salmonella typhi isolated<br>the river had dried up<br>the river had dried up<br>the river had dried up |
| Nkandla  | Thukela<br>Mfongosi<br>Manyana<br>Nsuze              | no salmonella typhi isolated<br>no salmonella typhi isolated<br>the river had dried up<br>6 colonies X 10 = 60 colonies of<br>s.typhi      |
|          | Nyawushane<br>Vumanhlamvu<br>Mhlathuze<br>Mdlelanga  | no salmonella typhi isolated<br>no salmonella typhi isolated<br>no salmonella typhi isolated<br>no salmonella typhi isolated               |

This sampling was undertaken in one month and some of the rivers have shown to have no typhoid bacilli and cannot be taken for granted that they are safe from the infection. Those rivers with negative results should be taken as positively infected. The period of sampling was too short not to miss the typhoid bacilli. A repeated sampling is to be done over a long period of time to be able not to miss the bacilli organisms. A moore pad can also be inserted in the river and left there for a long period. It can thereafter be collected and taken to the laboratory for examination. In this way there is no chance that one may miss typhoid bacilli.

Ongoye region health inspectors records, have proved that all above-mentioned rivers are positively infected. This record indicates sampling of these rivers over a period of ten (10) years, dating as back as 1982.



It is this state of positively and negatively infected rivers that there is no constant typhoid infection. The pattern that results from this state of affair is that which is indicated by the graphs in figures 3.4 and 3.5. The graphs reveal reported cases during certain months and no cases during other months. Such a pattern is evidenced in both 1989 and 1990 reporting periods. It is also the positively infection of river water with salmonella typhi that the control measures stated in chapter 2 should be practised by people at risk in the study area.

The positively examined water samples is a clear indication that people in the catchment area of the study area do not practise the control measures. The failure to practise the control measures is evidenced by the results of the water samples in table 4.1. It is these results that tell more about the pollution of rivers from the catchment. The positive results of water sampling was expected. It was expected that since people do not have toilets they defeacate indiscriminately and pollute the streams. The pollution of the streams is one way of not practising the control measures as hypothesized in chapter 1 that people do not practise the control measures.

No sample could be taken for bacteriological examination from the rivers that had dried up. Dried up rivers are grouped together with those rivers that were sampled by the office of health inspectors of Ongoye region, and were found to be positively infected. It is therefore assumed that dried up rivers are positively infected when there is running water and the users

thereof should take precautionary measures as stated in chapter 2.

This research inquiry as mentioned in its four aims in chapter 1, (the first aim) is to reveal the extent to which the diseases are perceived to be related to the environment. The nature of river water for harbouring salmonella typhi (found in water samples) which causes typhoid fever, is a clear indication of why typhoid is perceived to be related to the environment. (More information on the aims is in item 4.4)

When the rivers are so infected with salmonella typhi, it is important to know if the respondents do practise the control measures against typhoid. If they do not practise the control procedures as described by Kassner (Ca 1990) and Benenson (1970) in chapter 2, then, whatever they practise might have an impact on the environmental occurrence of typhoid. It has been the second aim of this research inquiry to indicate the extent to which the control measures against this disease have an impact of the environmental occurrence of the disease. The control measures by both the government officials and the public would appear insufficiently practised as there is a persistent nature of the three diseases (as indicated in fig. 3.2 to 3.5). It is for this non-practising of control measures that could have an impact on the environmental occurrence of the diseases. More information concerning the control measures is dealt with within this chapter under item 4.3 (Survey data collection and analysis.)



#### 4.2.2 Bilharzia Field Observation Results

This section intends to reveal the results of observing snail trapping, but unfortunately the institute of tropical diseases situated in Durban could not participate or show the researcher how snail trapping is done. The institute only traps snails if there is a request resulting from an outbreak of bilharzia in a particular area. Nevertheless the institute agrees with Kassner (Ca 1990) that all the rivers entering into the Indian ocean have these bilharzia carrying snails (see the intermediate hosts which are snails of the genus Balinus (S.haematobium) and Biomphalaria (S.mansoni) in annexure D.1 and D.2 respectively.) These are the snails that were supposed to have been observed by the researcher, but because of the abovementioned reason these snails could not be observed.

#### 4.2.3 Both Bilharzia and Typhoid Fieldwork Observation

This section observes certain projects done by the KwaZulu government employees together with the different communities in the study area. These projects are mainly done to curb and control bilharzia and mainly typhoid and other gastro-intestinal and waterborne diseases. These projects are further intended to help people stay away from contaminated water and to stop contamination of water. The projects include: spring protection, ferro-cement tank construction and ventilated improved pitlatrine construction (VIP latrine). It would appear that the standard of health of people does not keep pace with that of World Health Organization that by the year 2000 it should be "health for all." Living a healthy life is seen by this study as a very difficult

task particularly when people do not have money as indicated in table 4.17. The three projects mentioned above and that observed by the researcher were made to be cheap for everyone to afford. People seemed less engaged in these projects. By mere driving along the main roads it was discovered that no houses had the ferro-cement tanks and the VIP latrines.

When Khanyile (1984:4) looks at some of these projects he avers that:

It became imperative to adopt a system for water supply in rural areas that has a wider coverage and reasonably cheap whereby community members themselves participate actively and contribute to it in labour and in kind.

The cheap system in rural areas Khanyile is referring to is the protection and development of natural water springs so that these facilities can supply clean and safe potable water. (See annexure F.2 and F.3 on spring protection programmes that have been observed). The protected springs are the good source of water supply in the rural areas where a water purification system is not possible.

The results reveal that there was a considerable and significant improvement with regard to contaminating organisms in protected springs compared with unprotected springs.

(See, The Valley Trust - Annual Report, 1982:18)



Another programme that have been observed is the ferro-cement tank construction. This programme is gaining popularity in the rural areas where rain is abundant and where people have constructed the roofs of their houses using tiles and corrugated asbestos or corrugated iron sheets (See annexure F.1).

The third programme that have been observed is that of the construction of ventilation improved pit latrines (VIP - latrine). Evans (1987:3) writes:-

The principal way of preventing the spread of many tropical diseases is by using a suitably designed and constructed latrine. A suitable, easy-to-construct pit latrine for rural family is the innovative ventilated improved pit latrine (VIP - latrine) designed and proven in Zimbabwe by Dr P.R. Morgan of Blair research laboratory, in Harare.

These toilets are designed such that if flies get inside the pit they get out by the light coming through the vent pipe thus becoming trapped by a wire gauze on top of the vent pipe. Such flies die of unfavourable heat radiated by the dark coloured vent pipe (Evans, 1987), (See the VIP latrine diagrams in annexure G.1 to G.5).

These three observed programmes on spring protection, ferro-cement tank construction and VIP latrine construction are conjunctively done by both the kwaZulu government department of

Health and Agriculture in the study area. It could appear from the observation that these three programmes have not been extensively and convincingly done to be able to say that the people are safe from the infection. The allegation of insufficiency of the programmes is based on the respondents' responses. The responses have revealed that there is a lack of community health workers to introduce these programmes (See the following table 4.2).

Table 4.2: Respondent's view on the presence of community health workers (CHW)

| <u>Respondents</u>      | <u>Frequency</u> | <u>Percent</u> |
|-------------------------|------------------|----------------|
| Those who have seen CHW | 11               | 18.3           |
| Those who have not      | 47               | 78.3           |
| Those with no response  | 2                | 3.3            |
| <b>TOTAL</b>            | <b>60</b>        | <b>100</b>     |

The respondents who have seen the community health workers in the study area were 18.3% as opposed to those who have not seen them which is 78.3%. The non availability of community health workers could mean that:-

- (a) there are no community health workers in the study area;
- (b) they are there in the study area but do not perform their jobs (that is, they are loafing);
- (c) there is a shortage of community health workers to cover the different communities in the entire study area.



It is therefore the lack of the community health workers that also make the public not to practise and be unaware of the control measures against the three diseases as shown in the following tables 4.3 and 4.4.

Table 4.3 Practising a control against the three diseases

| Respondents      | Malaria |      | Typhoid |      | Bilharzia |      |
|------------------|---------|------|---------|------|-----------|------|
|                  | f       | %    | f       | %    | f         | %    |
| Those practising | -       | -    | 2       | 3,3  | -         | -    |
| Those who do not | 53      | 88,3 | 46      | 76,7 | 48        | 80   |
| Those uncertain  | 6       | 10,0 | 11      | 18,3 | 10        | 16,7 |
| No response      | 1       | 1,7  | 1       | 1,7  | 2         | 3,3  |
| TOTAL            | 60      | 100  | 60      | 100  | 60        | 100  |

Table 4.4 Knowledge about controlling the diseases

| Respondents       | Malaria |      | Typhoid |      | Bilharzia |      |
|-------------------|---------|------|---------|------|-----------|------|
|                   | f       | %    | f       | %    | f         | %    |
| With knowledge    | 2       | 3,3  | 1       | 1,7  | 2         | 3,3  |
| Without knowledge | 42      | 70,0 | 40      | 66,7 | 40        | 66,7 |
| Those uncertain   | 14      | 23,3 | 16      | 26,7 | 13        | 21,7 |
| No response       | 2       | 3,3  | 3       | 5,0  | 5         | 8,3  |
| TOTAL             | 60      | 100  | 60      | 100  | 60        | 100  |

#### 4.2.4 Malaria fieldwork observation results

This section intends revealing those programmes that have been observed by the researcher as a method of obtaining data either than sampling techniques and administration of questionnaires (in chapter 1 item 1.7). The programmes include mosquito check

spraying and actual or large scale mosquito spraying. The programmes are mainly for malaria control.

Check spraying of mosquitoes in the malarious areas is done by the health field assistants to detect the types of mosquitoes found in the particular area. None of these workers are found in Nkandla district, few are found in Inkanyezi district and a lot are found in Ongoye and Enseleni districts. Their greater numbers of the health field assistants in the last two districts is as a result of many malaria cases that have been reported from Ongoye and Enseleni districts.

It is believed that, because of the presence of these health field assistants together with check spraying and a large scale mosquito spraying, the prevalence of malaria should decrease. Surely, the cases in table 3.1 and 3.2 confirm the decreasing numbers of malaria from 228 in 1989 to 88 in 1990.

During the check spraying conducted in my presence, in Ongoye district, malaria carrying mosquitoes were observed. Such mosquitoes were of the anopheles genus. The female mosquito is the carrier of the plasmodium parasite. The parasite is present in her salivary glands and is injected into the bloodstream of the person who is bitten by the anopheles mosquito (see the difference between malaria and non-malaria carrying mosquito in Annexure E.1 and E.2 respectively.)



After it is known that the malaria carrying mosquitoes are present in the area, the large scale mosquito spraying follows. The idea here is to eradicate the mosquitoes. What was observed was that not all areas with malaria carrying mosquitoes and with reported malaria cases have been sprayed. (This information was learnt from the field officer who was conducting the observation) The non-spraying of the areas affected with malaria could contribute to the failure to control and combat the disease. It could also contribute to the kind of pattern discussed in chapter 2 - Theoretical background.

The non spraying of the areas affected with malaria could have a good reasoning back up for example the shortage of money to buy extra D.D.T. or it is the government procedure not to spray newly affected areas. But such a failure to exercise the control measures against malaria does not differ in any way from the shortcomings of both government employees and the public. These shortcomings contribute to the persistent nature of malaria. If the government suggests not to spray newly affected areas or areas with few cases, this could be tantamount to the failure of the respondents to trace contacts/suspects in table 4.8. Such failure to trace contacts which is equivalent to the failure to spray, is the step towards disregarding preventive medicine of which 95% in table 4.6 agreed to be engaged in. If then preventive medicine is disregarded there would therefore be a persistence nature of malaria in the study area.

#### 4.3 SURVEY DATA ANALYSIS AND INTERPRETATION

The study comprises of two sets of questionnaires. The first set of questionnaires was directed to the KwaZulu government health workers working in the four district of the study area. Twenty respondents were randomly chosen from the four districts and were interviewed. The interview was conducted by the researcher himself. The second set of 60 questionnaires was directed to the members of the public from the four districts. For each district 15 questionnaires were administered by the health inspector responsible for a particular district. Even here the respondents were randomly chosen from each district.

The reason for having two sets of questionnaires was that not all of the hypotheses were to be proved right or wrong by the members of the public. Some of the hypotheses were to be proved by the KwaZulu health workers who are responsible for the control of the three diseases.

Raw data has been analysed by the aid of the Systematic Analysis System (SAS programme) of the department of geography in the University of Zululand. The graphs have been made by the use of Lotus programme in the department of geography (University of Zululand).

The responses of the respondents are discussed in great length in the following subsections.



#### 4.3.1 Responses from health workers

As mentioned earlier on that the first set of questionnaires was directed to the KwaZulu government health workers. The main aim was to get their responses concerning the hypothesis stating that health workers are engaged in curative medicine more than preventive medicine (in chapter 1 item 1.7). Health workers that were interviewed (see table 4.5) were categorized in terms of their occupations. This is to help reveal the diversity of views from one category to another.

Table 4.5 - Health workers by occupation

| Respondents              | Frequency | Percent |
|--------------------------|-----------|---------|
| Health Inspectors        | 6         | 30.0    |
| Community Health Workers | 6         | 30.0    |
| Health Assistants        | 4         | 20.0    |
| Health Facilitators      | 2         | 10.0    |
| Health Field Officer     | 2         | 10.0    |
| TOTAL                    | 20        | 100.0   |

All of the above occupations are engaged in both preventive medicine (95%) and primary health care (70%) more than they are engaged in curative medicine (20%). This information on health workers involvement is contained in table 4.6. The information reveals that the hypothesis which regards health workers as engaged in curative medicine more than preventive medicine is incorrect (see table 4.6). If the situation in table 4.6 stands as it is even in practice, then the diseases should have no

chance of spreading and affecting people. It means that the three diseases can be prevented before starting. But regardless of this situation where a majority of health workers interviewed are engaged in preventive medicine and primary health care, people in the study area get sick. The pattern of the infection is as indicated in chapter 2.

Table 4.6 - Varied health practices response of health workers

| Respondents | Preventive Medicine |     | Primary health care |     | Curative Medicine |     |
|-------------|---------------------|-----|---------------------|-----|-------------------|-----|
|             | f                   | %   | f                   | %   | f                 | %   |
| Engaged in  | 19                  | 95  | 14                  | 70  | 4                 | 20  |
| Not engaged | 1                   | 5   | 6                   | 30  | 16                | 80  |
| TOTAL       | 20                  | 100 | 20                  | 100 | 20                | 100 |

The interviewees have agreed that typhoid and bilharzia are still spreading increasingly than before (see table 4.7 on the health workers views on typhoid and bilharzia spread). This situation, regardless of the involvement of health workers to preventive medicine and primary health care, could mean that the existing pattern of the two diseases (that is typhoid and bilharzia) is related to the failure of health programmes in place. To reveal whether or not the emerging pattern of the three diseases is related to the health programmes in place, has been one of the basic aims of this research inquiry in chapter one.



Table 4.7 - Health workers views on the typhoid and bilharzia spread

| Respondents' view   | Typhoid   |         | Bilharzia |         |
|---------------------|-----------|---------|-----------|---------|
|                     | Frequency | Percent | Frequency | Percent |
| It is spreading     | 6         | 30      | 9         | 45      |
| It is not spreading | 5         | 25      | 4         | 20      |
| Not certain         | 4         | 20      | 4         | 20      |
| No response         | 5         | 25      | 3         | 15      |
| TOTAL               | 20        | 100     | 20        | 100     |

One comes to a conclusion that better methods have been used before to decrease the spread of the diseases which methods are not used during this research.

The above information that is from table 4.5 to 4.7 drives the research enquiry to examining whether the health workers involvement in the control of the three diseases as hypothesized, fall under curative rather than preventive medicine. Curative medicine means the treatment of patients with medication whereas preventive medicine includes:-

- (a) Tracing and treatment of contacts and suspects to ensure that the causative agents can be killed before the contacts and suspects show signs and symptoms of the disease or before they transmit the disease.
- (b) Taking of bloodsmears from the people in the case of malaria to identify the trophozoites and gametocytes which

are the indicators that a person has been infected with malaria.

(c) Treatment of the environment by

- . preventing pollution of natural water sources by human excreta in the case of typhoid and bilharzia;
- . spraying dams and lakes with a film of certain type of oil to suffocate mosquito larvae.

(d) Spraying of mosquitoes in order to kill them.

(e) Health education to make anyone aware of the disease occurrence and their prevention.

(f) Legal action to enforce compliance with health requirements.

(g) Taking of rectal swabs to ascertain whether people do excrete the micro organisms causing typhoid.

(h) Water sampling for bacteriological analysis of typhoid disease causative agents.

(i) Urine or stools sampling to ascertain whether people do excrete causative agents of bilharzia.

(j) Trapping of snails to identify bilharzia carrying from non bilharzia carrying snails.



To know whether the KwaZulu health workers in the study area are engaged in preventive or curative medicine, the health workers had to be interviewed on the aspects of preventive medicine. If the health workers are engaged in all these aspects, it will indicate that they are engaged in preventive medicine. But it was not the case as revealed by the following tables 4.8 to 4.16.

Table 4.8 - The tracing of contacts/suspects by health workers

| Responses           | Malaria |     | Typhoid |     | Bilharzia |     |
|---------------------|---------|-----|---------|-----|-----------|-----|
|                     | f       | %   | f       | %   | f         | %   |
| Successful traces   | 4       | 16  | 4       | 20  | 6         | 30  |
| Unsuccessful traces | 16      | 80  | 15      | 75  | 13        | 65  |
| Not certain         | -       | 100 | 1       | 5   | 1         | 5   |
| TOTAL               | 20      | 100 | 20      | 100 | 20        | 100 |

Tracing of the contacts/suspects is done by 20% in the case of malaria, 20% in the case of typhoid and 30% in the case of bilharzia. This lack on tracing of contacts is the first step of not following the preventive medicine by the health workers.

Table 4.9: The treatment of the environment by health workers

| Respondents       | Malaria |     | Typhoid |     | Bilharzia |     |
|-------------------|---------|-----|---------|-----|-----------|-----|
|                   | f       | %   | f       | %   | f         | %   |
| Those who treated | -       | -   | 5       | 25  | 5         | 25  |
| Those who did not | 14      | 70  | 10      | 50  | 12        | 60  |
| Not certain       | 6       | 30  | 5       | 25  | 3         | 15  |
| TOTAL             | 20      | 100 | 20      | 100 | 20        | 100 |

No one treated the environment in the case of malaria, 25% in the case of both typhoid and bilharzia respectively. The lack of treatment of the environment is another step of ignoring the known preventive medicine by the health workers. This lack can be a contribution towards the persistence nature of the three diseases.

Table 4.10: Health education given by health workers

| Respondents                   | Malaria |     | Typhoid |     | Bilharzia |     |
|-------------------------------|---------|-----|---------|-----|-----------|-----|
|                               | f       | %   | f       | %   | f         | %   |
| Gave health education         | 2       | 10  | 9       | 45  | 11        | 55  |
| Did not give health education | 12      | 60  | 6       | 30  | 6         | 30  |
| Not sure                      | 6       | 30  | 5       | 25  | 3         | 15  |
| TOTAL                         | 20      | 100 | 20      | 100 | 20        | 100 |

Only 10% of the respondents gave health education in the case of malaria, 45% in the case of typhoid and 55% in the case of bilharzia.



This third method of preventive medicine is tried by the health workers. But it would appear that this third preventive medicine has not reached a standard where one would be satisfied that it is fully practised to help in reducing the spread of the three diseases.

Table 4.11 : Legal action taken by health workers

| Respondents               | Malaria |     | Typhoid |     | Bilharzia |     |
|---------------------------|---------|-----|---------|-----|-----------|-----|
|                           | f       | %   | f       | %   | f         | %   |
| Took legal action         | -       | -   | 1       | 5   | 1         | 5   |
| Did not take legal action | 14      | 70  | 14      | 70  | 16        | 80  |
| Not sure                  | 6       | 30  | 5       | 25  | 3         | 15  |
| TOTAL                     | 20      | 100 | 20      | 100 | 20        | 100 |

Health workers do not take legal action for those members of the public who do not comply with the health requirements of controlling the three diseases. An average of 73,3% of the respondents do not take legal action to enforce the public in the study area comply with disease control measures. It must be nevertheless pointed out that this fourth method of preventive medicine is not a good indicator of whether preventive medicine is done or not. It depends upon community members whether they cooperate with health requirements or not. If they do then there is no need of taking legal action. The most important issue concerning legal action taken, is that one raised by Ngubane (1986) when he said that there is no legal means of enforcing some of the control measures against certain diseases like enforcing the construction of pit latrines.

Table 4.12 : Taking of blood smears and mosquito spraying by health workers

| Respondents | Frequency | Percent |
|-------------|-----------|---------|
| Who did it  | 4         | 20      |
| Who did not | 10        | 50      |
| Not certain | 6         | 30      |
| TOTAL       | 20        | 100     |

Once more the responses in table 4.12 are not a good indicator of whether or not their preventive medicine is adopted, because 75% of the respondents did not control malaria. Malaria is controlled by the health inspectors' office situated at Jozini which is out of the study area. Nevertheless there are field officers in the study area who were interviewed and they make 20% of the interviewees.

It would appear therefore that 50% of the health workers did not control malaria and 30% were not certain. These percentages indicate how one health department is separated into many sections not interlinked to one another. If they were interlinked the 80% of the respondents would be engaged, though not fully, in the control of malaria. The lack of this interlinkage brought about by either the government or the sections themselves contributes to the persistence nature of malaria.



Table 4.13 : Taking of rectal swabs by health workers

| Respondents    | Frequency | Percent |
|----------------|-----------|---------|
| Who took swabs | 3         | 15      |
| Who did not    | 12        | 60      |
| Not certain    | 5         | 25      |
| TOTAL          | 20        | 100     |

Only 15% of the health workers took rectal swabs for typhoid bacilli examination. The lack of taking rectal swabs can be a contributory factor in the spread of the typhoid fever.

Table 4.14 : Water sampling by health workers

| Respondents      | Frequency | Percent |
|------------------|-----------|---------|
| Who did sampling | 5         | 25      |
| Who did not      | 10        | 50      |
| Not sure         | 5         | 25      |
| TOTAL            | 20        | 100     |

Water sampling for typhoid bacilli (*salmonella typhi*) examination was done by 25% of the health workers which indicate a lack in the practice of the preventive medicine.

Table 4.15 : Urine and stools sampling by health workers

| Respondents      | Frequency | Percent |
|------------------|-----------|---------|
| Who did sampling | 3         | 15      |
| Who did not      | 14        | 70      |
| Not sure         | 3         | 15      |
| TOTAL            | 20        | 100     |

Table 4.16 : Trapping of snails by health workers

| Respondents      | Frequency | Percent |
|------------------|-----------|---------|
| Who traps snails | 2         | 10      |
| Who did not      | 15        | 75      |
| Not sure         | 3         | 15      |
| TOTAL            | 20        | 100     |

Urine and stools sampling was done by 15% of the respondents (see table 4.15). Snails were trapped by 10% of the respondents (see table 4.16). In both table 4.15 and 4.16 a picture of lack of practising the two preventive medicine is being portrayed. If urine and stools sampling is not done and snails are not trapped, it would be difficult to control the spread of typhoid. The non compliance with the control measures against bilharzia, could mean that health workers will have to adopt curative medicine vis-a-vis preventive medicine.



When health workers were asked whether they are engaged in curative medicine or preventive medicine, 95% answered the latter. This response proves the hypothesis wrong, which states that health workers are engaged in curative medicine more than preventive medicine. Something interesting is that when health workers were interviewed on the aspects of preventive medicine that is from table 4.8 to 4.16 above, none of these preventive measures have been fully practised. One therefore concludes that though health workers are engaged in preventive medicine in principle, no effort is done to practise these preventive measures.

#### 4.3.2 Responses from members of the public

Questionnaires were directed to the members of the public in the study area. The responses obtained contributed to proving whether the research hypotheses were accepted or rejected. The hypotheses that have to do with the members of the public are the first, third and last in item 1.6 of chapter 1. The first hypothesis is that people who are poor and who do not have money, will do nothing but expect the government to do everything in its power to prevent them from contracting the diseases. It is thirdly hypothesized that people do not know the control measures against the three environmentally related diseases. The fourth and the last hypothesis is that the environment which has been interfered with by humans is in turn determining the pattern of the spread. The interference with the environment is thought to be caused by the ignorance people have concerning ways and means of safeguarding themselves against the environment.

The sample size of respondents was 60, of the ages between 0 and 61 and above. Most of the respondents were females (53,3%) and males were 47,7%. The majority of the respondents resided in rural areas and comprised of 73,3% than peri-urban respondents who comprised of 26,7%.

#### 4.3.2.1 Responses to the first hypothesis

When dealing with the first hypothesis as mentioned in item 4.3.2 above, related questions such as in the following tables 4.17; 4.18 and 4.19 were looked at.

Table 4.17 : Availability of money to prevent the diseases

| Respondents         | Malaria |      | Typhoid |      | Bilharzia |      |
|---------------------|---------|------|---------|------|-----------|------|
|                     | f       | %    | f       | %    | f         | %    |
| Those with money    | 9       | 15,0 | 5       | 8,3  | 5         | 8,3  |
| Those without money | 44      | 73,3 | 49      | 81,7 | 48        | 80,0 |
| No response         | 7       | 11,7 | 6       | 10,0 | 7         | 11,7 |
| TOTAL               | 60      | 100  | 60      | 100  | 60        | 100  |

Table 4,17 clearly reveals that the respondents do not have money to prevent themselves from ill-effect of the three diseases. 73,3% in the case of malaria, 81,7% in the case of typhoid and 80,0% in the case of bilharzia, give proof concerning the lack of money to prevent ill-effects of the diseases. When such a large number of people complain about the unavailability of money, it is highly unlikely that they can practise the preventive measures. The preventive control referred to here is



that which have been seen during the field work observation in item 4.3 of this chapter.

Table 4.18 : Responsibility of preventing the three diseases

| Responsibility  | Malaria |      | Typhoid |      | Bilharzia |      |
|-----------------|---------|------|---------|------|-----------|------|
|                 | f       | %    | f       | %    | f         | %    |
| Local community | 5       | 8,3  | 4       | 6,7  | 6         | 10,0 |
| Zulu government | 28      | 46,7 | 35      | 58,3 | 34        | 56,7 |
| No knowledge    | 24      | 40,0 | 18      | 30,0 | 16        | 26,7 |
| No response     | 3       | 5,0  | 3       | 5,0  | 4         | 6,7  |
| TOTAL           | 60      | 100  | 60      | 100  | 60        | 100  |

It was evidently the perception of the total community (for example 46,7% in the case of malaria, 58,3% in the case of typhoid and 56,7% in the case of bilharzia) that the government should protect the people from the three diseases. A larger group (for example 40% in the case of malaria, 30% in the case of typhoid and 26,7% in the case of bilharzia) did not know exactly who has the responsibility of protecting them from the said diseases. This is in contrast to the few respondents who thought that it was their responsibility to protect themselves from the three diseases.

It is therefore the lack of money and hope to be safeguarded by the government that respondents would do nothing to practise the control measures against the three diseases as shown in the following table 4.18.

Table 4.19 : The practice of control measures

| Respondents           | Malaria |      | Typhoid |      | Bilharzia |      |
|-----------------------|---------|------|---------|------|-----------|------|
|                       | f       | %    | f       | %    | f         | %    |
| Who practised control | -       | -    | 2       | 3,3  | -         | -    |
| Who did not practise  | 53      | 88,3 | 46      | 76,7 | 48        | 80   |
| Who were uncertain    | 6       | 10,0 | 11      | 18,3 | 10        | 16,7 |
| No responses          | 1       | 1,7  | 1       | 1,7  | 2         | 3,3  |
| TOTAL                 | 60      | 100  | 60      | 100  | 60        | 100  |

The respondents who did not practise the control measures are 88,3% in the case of malaria, 76,7% in case of typhoid and 80% in the case of bilharzia. It is worth noting to discover that no respondent practised the control measures against malaria and bilharzia. Very few respondents (that is 3,3%) practise control measures against typhoid. The lack in the practice of control measures is related to the presence of the community health workers as commented under table 4.2 in this chapter.

It is therefore clearly evidenced by tables 4.17; 4.18 and 4.19 that the hypothesis concerning poverty and the perception of government's involvement in the prevention of the three diseases, is proved correct. It is in principle the South African government's responsibility to see to it that people are free from these water borne diseases. Sharing the same idea is Ngubane (1986) who wrote that solution to this complex problem depends on government's laying the necessary infrastructure for adequate clean domestic water supplies.



#### 4.3.2.2 Responses to the third hypothesis

As enunciated earlier, the third hypothesis is on the people's knowledge of control measures against the three environmentally related diseases. The following responses as shown in table 4.20 were gathered.

Table 4.20 : Knowledge of disease control

| Respondents       | Malaria |      | Typhoid |      | Bilharzia |      |
|-------------------|---------|------|---------|------|-----------|------|
|                   | f       | %    | f       | %    | f         | %    |
| With knowledge    | 2       | 3,3  | 1       | 1,7  | 2         | 3,3  |
| Without knowledge | 42      | 70,0 | 40      | 66,7 | 40        | 66,7 |
| Not certain       | 14      | 23,3 | 16      | 26,7 | 13        | 21,7 |
| No response       | 2       | 3,3  | 3       | 5,0  | 5         | 8,3  |
| TOTAL             | 60      | 100  | 60      | 100  | 60        | 100  |

Most respondents in table 4.20 did not have the knowledge to control the three diseases. For example 70% in the case of malaria; 66,7% in the case of typhoid and bilharzia. It is therefore clear that people do not know and practise the control measures against the three diseases. This then proves the above-mentioned third hypothesis correct.

#### 4.3.2.3 Responses to the fourth hypothesis

The fourth and the last hypothesis as per item 4.3.2 is about the environment which, has been interferred with by humans which in turn determines the spread of the three diseases. For the hypothesis to be unaccepted the respondents were expected to have

been practising and controlling the environment so that it does not become suitable for spreading the three diseases.

It was not the case in the study area as the respondents in table 4.19 and 4.20 did not know and practise the control measures mentioned in chapter 2.3. Table 4.20 reveals that the following percentages that is 70% in the case of malaria; 66,7% in the case of typhoid and bilharzia were the responses from the respondents that had no knowledge of the control measures. Table 4.19 indicates that the respondents did not practise the control measures as revealed by 88,3% in the case of malaria; 76,7% in the case of typhoid and 80% in the case of bilharzia.

If the respondents did not know and practise the control measures, they would easily interfere with the environment. Such interference includes polluting water and land with human excretas and interferring with vector's habitats. Interference further necessitates the spread of the three diseases to different communities either than in the study area. The fact that the environment now spreads the three diseases must be seen in the light of human failure to know and practise the control measures. The non-compliance with the control measures which in turn causes an interference with the environment would cause a situation where it would be difficult to control the spread of the three diseases (as indicated in chapter 2.3).



#### 4.4 FULFILMENT OF THE AIMS OF RESEARCH INQUIRY

This section tries to reveal whether or not the aims of the research inquiry have been fulfilled. As enunciated earlier in chapter 1.3 there are four basic aims. The first one which deals with revealing the extent to which the three diseases are perceived to be related to the environment have been fulfilled and discussed in item 4.2.1. The remaining three aims deal with

(b) Indicating extent to which the control measures against these diseases have an impact on the environmental occurrence of the same diseases. (c) Revealing whether or not the emerging pattern of the three diseases is related to community health programmes in place in the study area. (d) Pinpointing some demographic variables that are related to the understanding of the occurrence of the three diseases in the study area.

To tackle the second and the third aims, the following was discovered during field observation and data collection from the offices of environmental health officers at Ngwelezane and in Jozini.

The pattern of malaria fever as indicated in table 3.1 and in figure 3.2 and 3.3 have caused the authorities to spray the mosquitoes only in those areas with more number of cases during period 1989/90 only. The areas with less number of malaria cases during the same period were never sprayed. Such a move of not spraying all affected areas could have a sensible reasoning behind it. No matter what reasoning it is, on the other hand one



asks ones' self as to why the control was not conducted. One is also likely to conclude that such a move, could lead to the recurring number of cases the following years that is in 1991/92.

The pattern of typhoid as indicated in table 3.2 and in fig. 3.4 and 3.5 have caused the KwaZulu health authorities to abandon tracing of typhoid contacts and suspects. These authorities have regarded tracing as helpless in the eradication of the diseases. They have therefore embarked upon spring protection, ferro-cement tank construction and sanitation as a possible medication to control and even to eradicate typhoid and other water borne and intestinal related diseases.

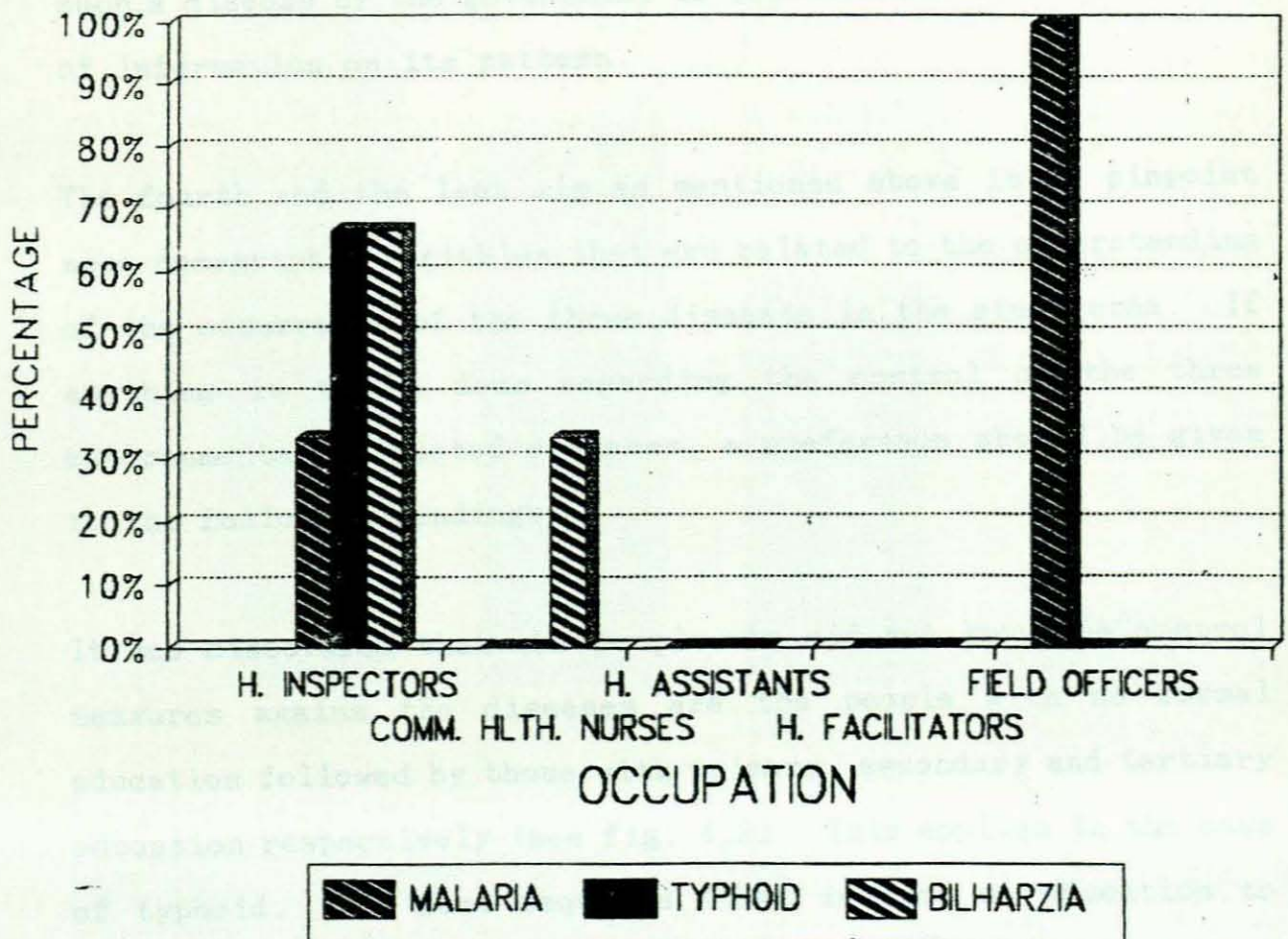
This total neglect on suspect/contacts tracing, could perpetuate the spread of typhoid. While spring protection, ferro-cement tank construction and sanitation are very slow processes and are a long term goal, people are in the meantime getting sick and their contacts/suspects are not attended to. (See fig.4.1 which is a graph of a of number occupations which no longer trace typhoid contacts/suspects.) It is evidenced from the graph that all occupations except health inspectors no longer trace typhoid contacts/suspects. Even with the health inspectors about 35% of them have abandoned tracing of contacts/suspects.

Bilharzia pattern could not be established. Once more this disease is not a notifiable medical condition which makes it difficult to know its occurrence and to plan for its prevention. Whenever there are cases of bilharzia the hospital or clinic



Fig. 4.1

## CONTACT TRACING BY OCCUPATION



authorities are not legal bound to notify such cases in order to effect necessary control measures. Even if the hospital notifies bilharzia cases, there is no law enforcing compliance thereof. It is for these reasons that the researcher could not find statistical information regarding this disease because no one keeps such information.

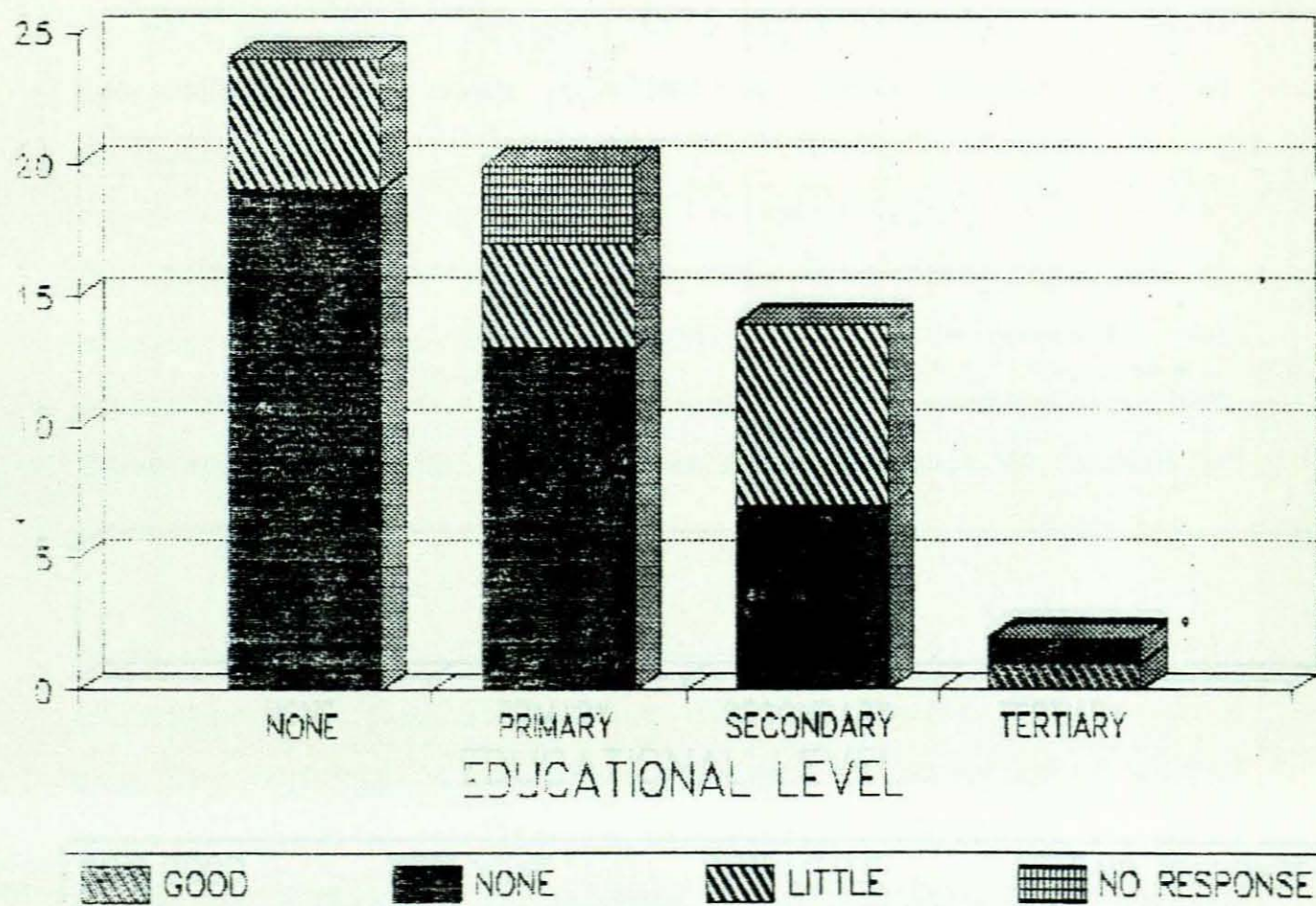
Such a state of affair could possibly lead to the failure of the KwaZulu government to control this disease. Even budgeting for such a disease by the government is questionable because of lack of information on its pattern.

The fourth and the last aim as mentioned above is to pinpoint some demographic variables that are related to the understanding of the occurrence of the three diseases in the study area. If anything is to be done regarding the control of the three environmentally related diseases, a preference should be given to the following findings:-

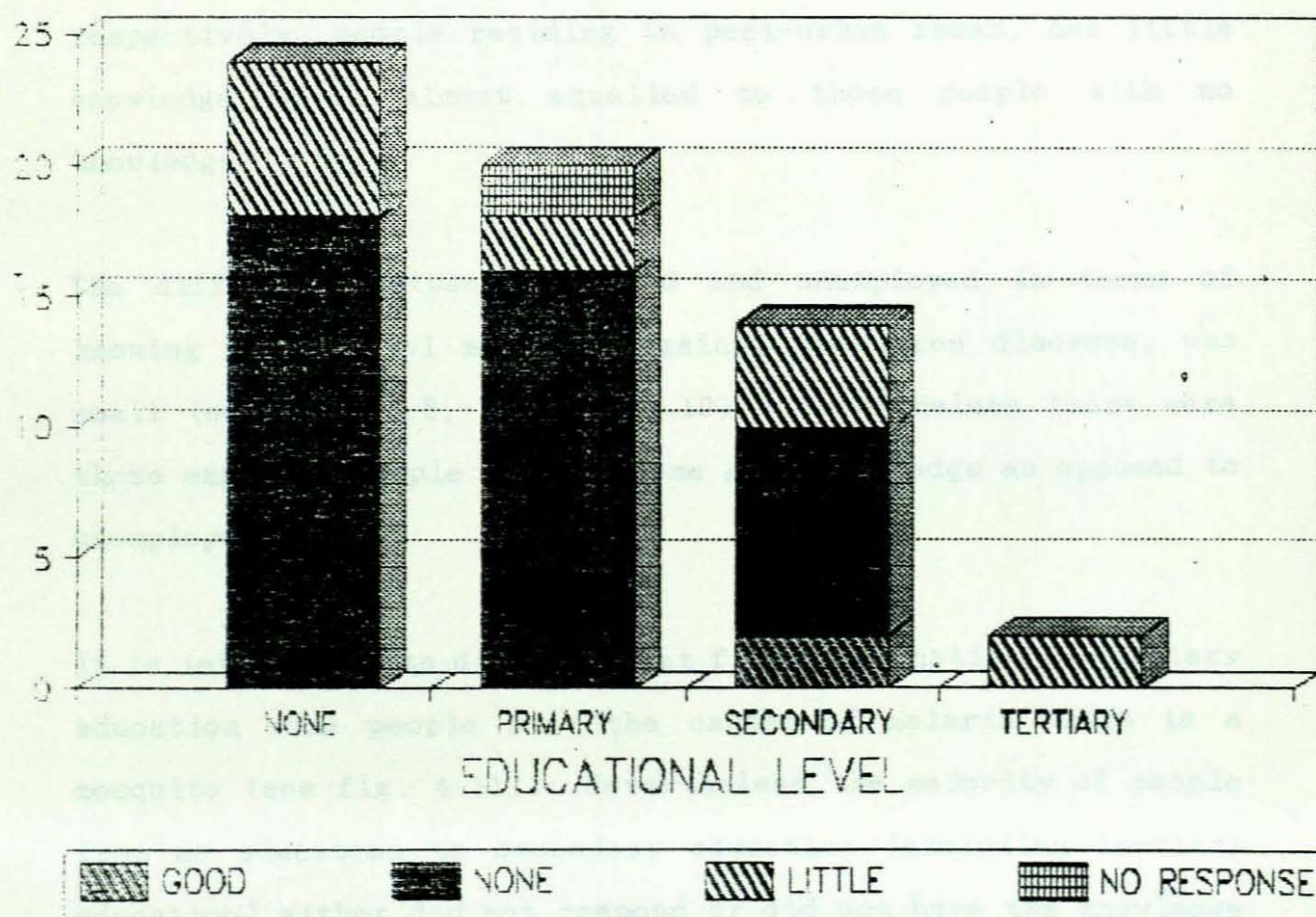
It was discovered that the people who did not know the control measures against the diseases are the people with no formal education followed by those with primary, secondary and tertiary education respectively (see fig. 4.2). This applies in the case of typhoid. The same sequence (that is from no education to tertiary education) also applies in the case of malaria and bilharzia except that those people with tertiary education had little knowledge and good knowledge respectively. (See fig. 4.3 where tertiary education people had little knowledge on the



## KNOWLEDGE OF TYPH. CONTROL BY EDUC. LEV.



# KNOWLEDGE OF MALAR. CONTROL BY ED. LEV.





control of malaria) (See also fig. 4.4 where tertiary education people had good knowledge on the control of bilharzia).

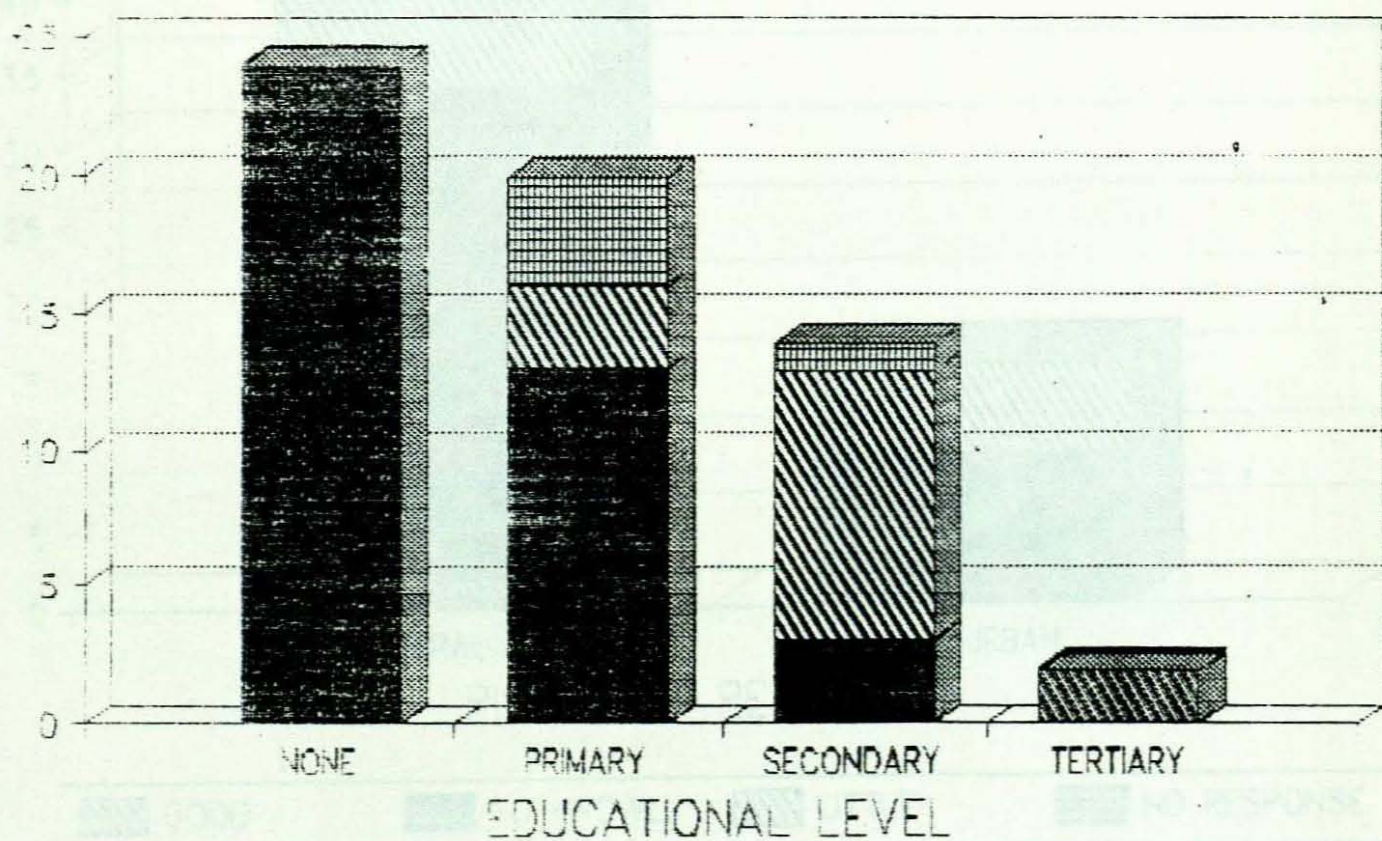
Where members of the public were interviewed concerning the knowledge of the disease control, most of them in both rural and peri-urban did not have any knowledge of the control measures against the diseases. (See especially fig. 4.5 which indicates knowledge to control malaria by residents) In the case of knowledge to control typhoid and bilharzia fig. 4.6 and fig. 4.7 respectively, people residing in peri-urban areas, had little knowledge which almost equalled to those people with no knowledge.

The difference between employed and unemployed in terms of knowing the control measures against the three diseases, was small (see fig. 4.8, 4.9 and 4.10). Nevertheless there were those employed people who had some good knowledge as opposed to unemployed people.

It is interesting to discover that from no education to tertiary education some people know the causes of malaria which is a mosquito (see fig. 4.11). Nevertheless the majority of people from no education to secondary education (excluding tertiary education) either did not respond or did not have the knowledge or gave wrong causes of malaria. In the case of typhoid in fig. 4.12 the above situation (including tertiary education level) applies in the sense that all educational levels had given "germs" and "unhealthy water" as the correct answers. But again

KNOWLEDGE OF MALARIA CONTROL BY RESID.

KNOWLEDGE OF BILHARZIA CONTROL BY EDUC.



GOOD

NONE

LITTLE

NO RESPONSE



## KNOWLEDGE OF MALARIA CONTROL BY RESID.

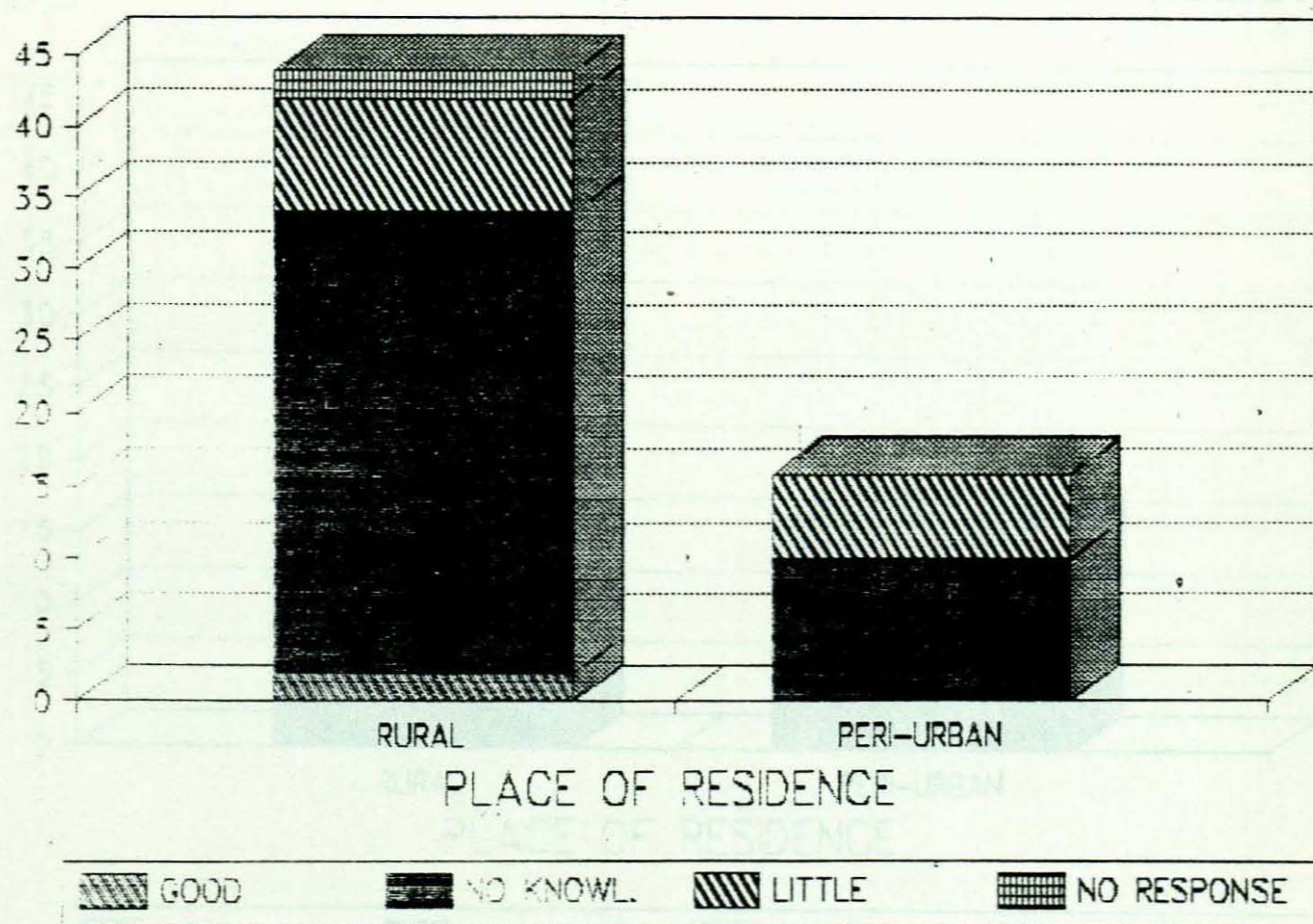


Fig. 4.6

## KNOWLEDGE OF TYPHOID CONTROL BY RESID.

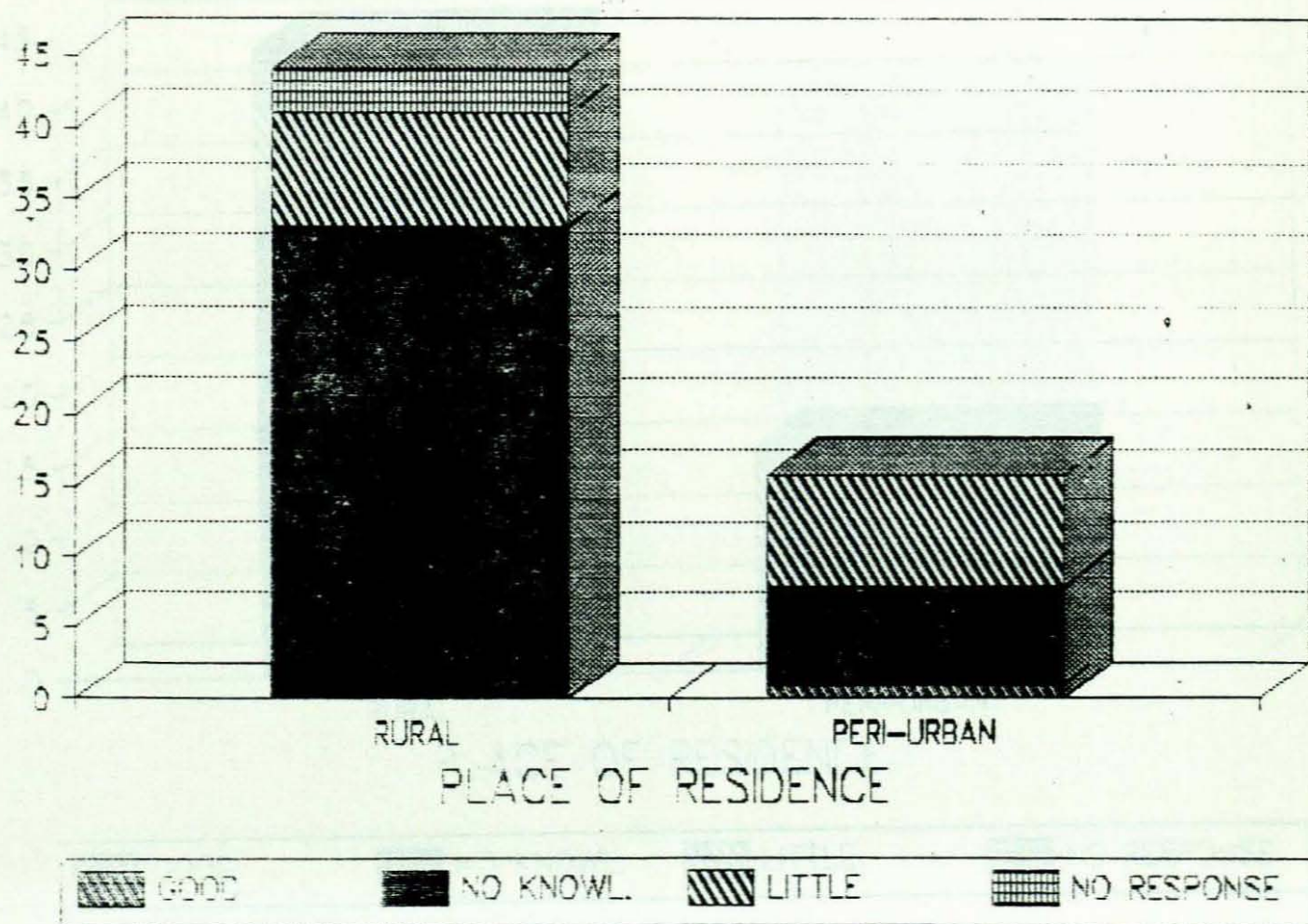
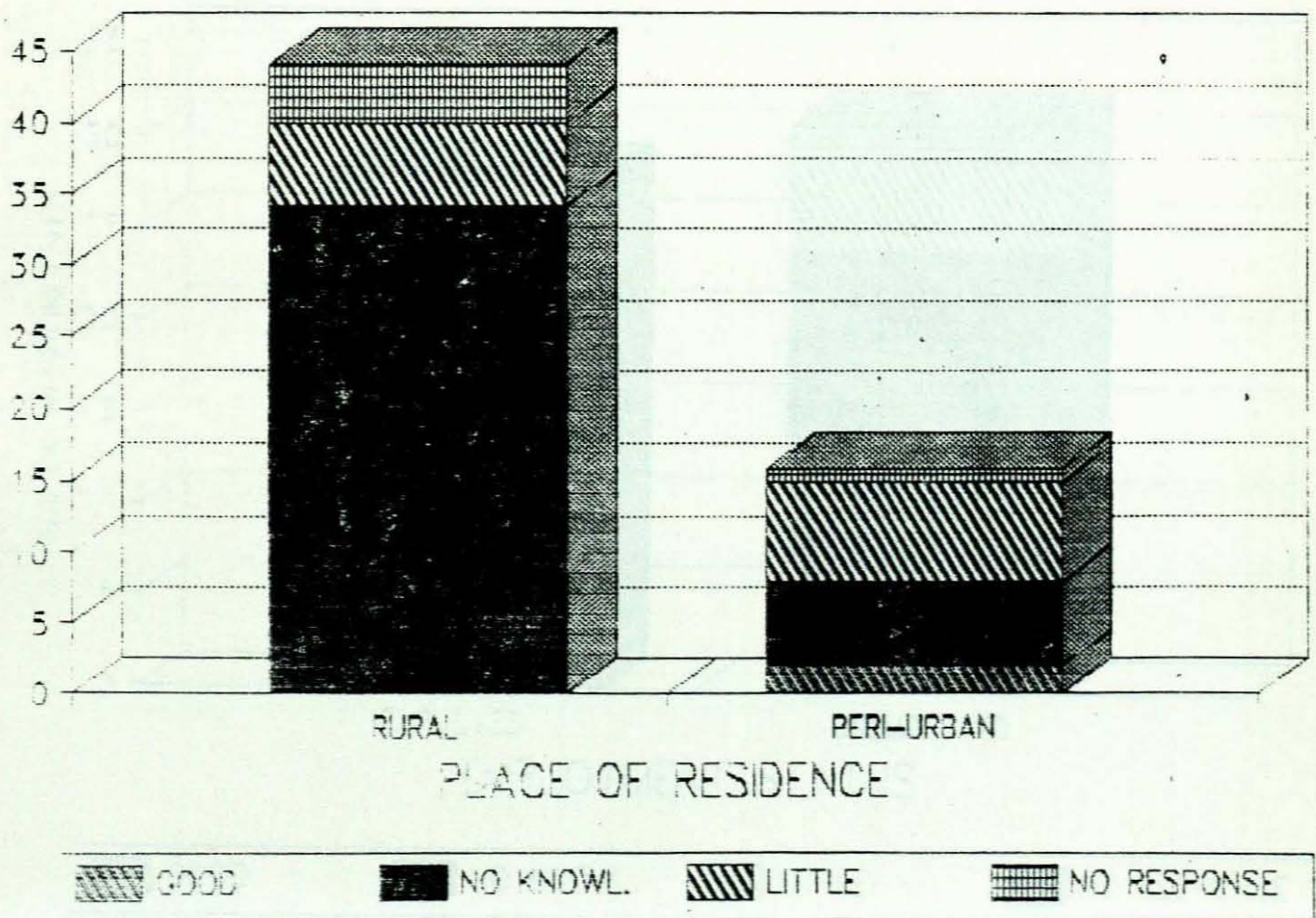




Fig. 4.7

## KNOWLEDGE OF GILHARZIA CONTROL BY RES.



## KNOWLEDG. OF MALARIAL CONTROL BY EMPLOY.

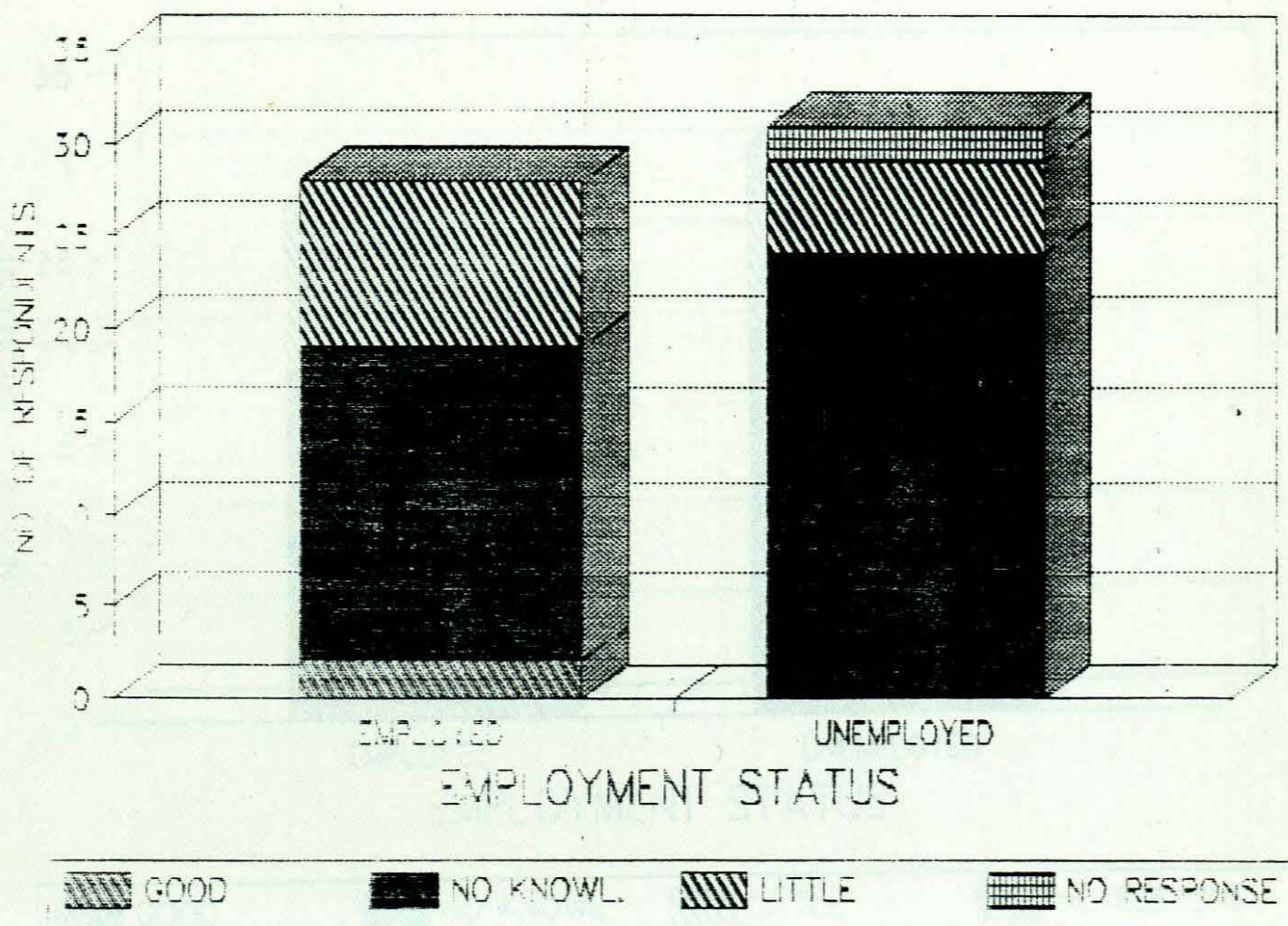
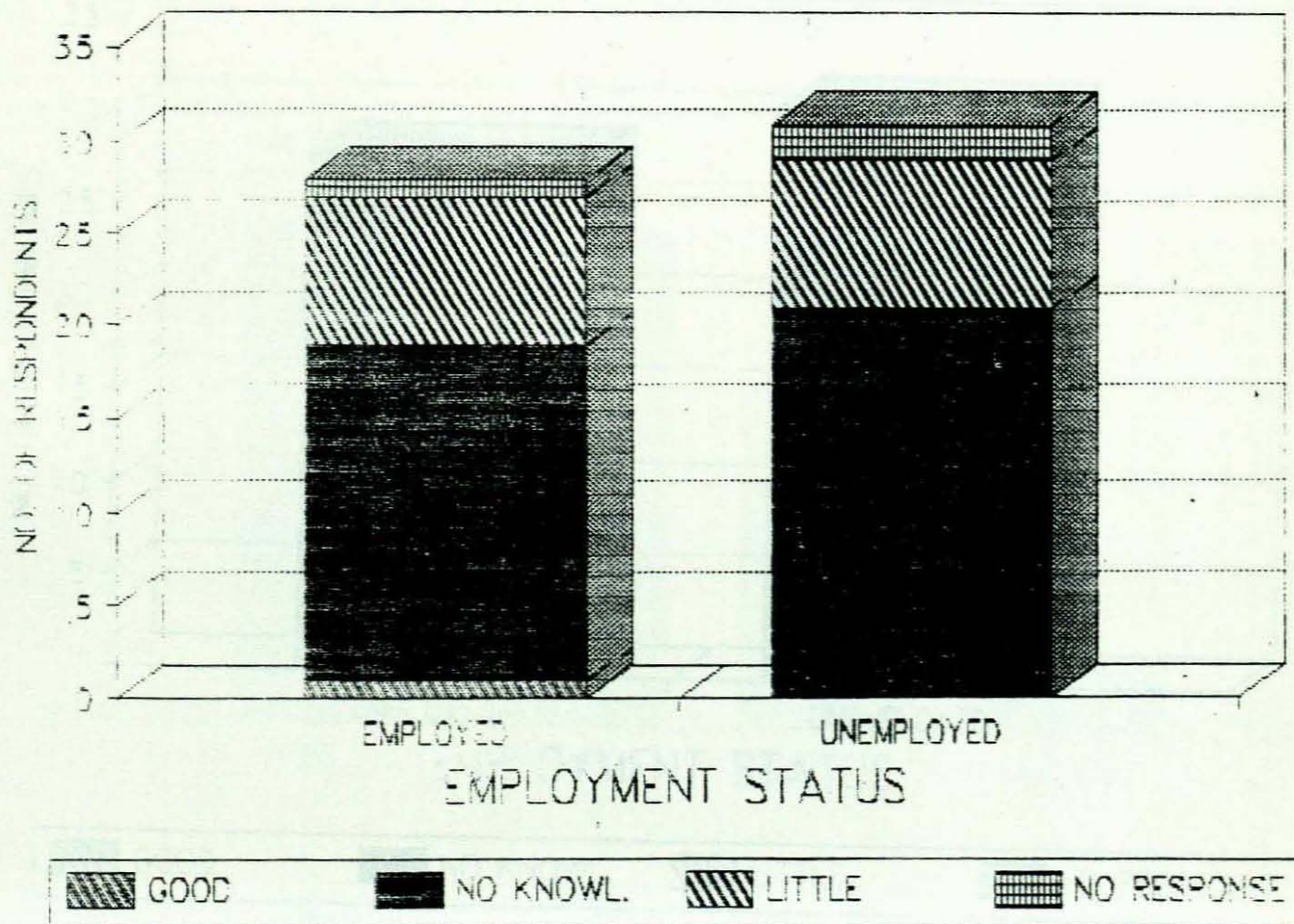


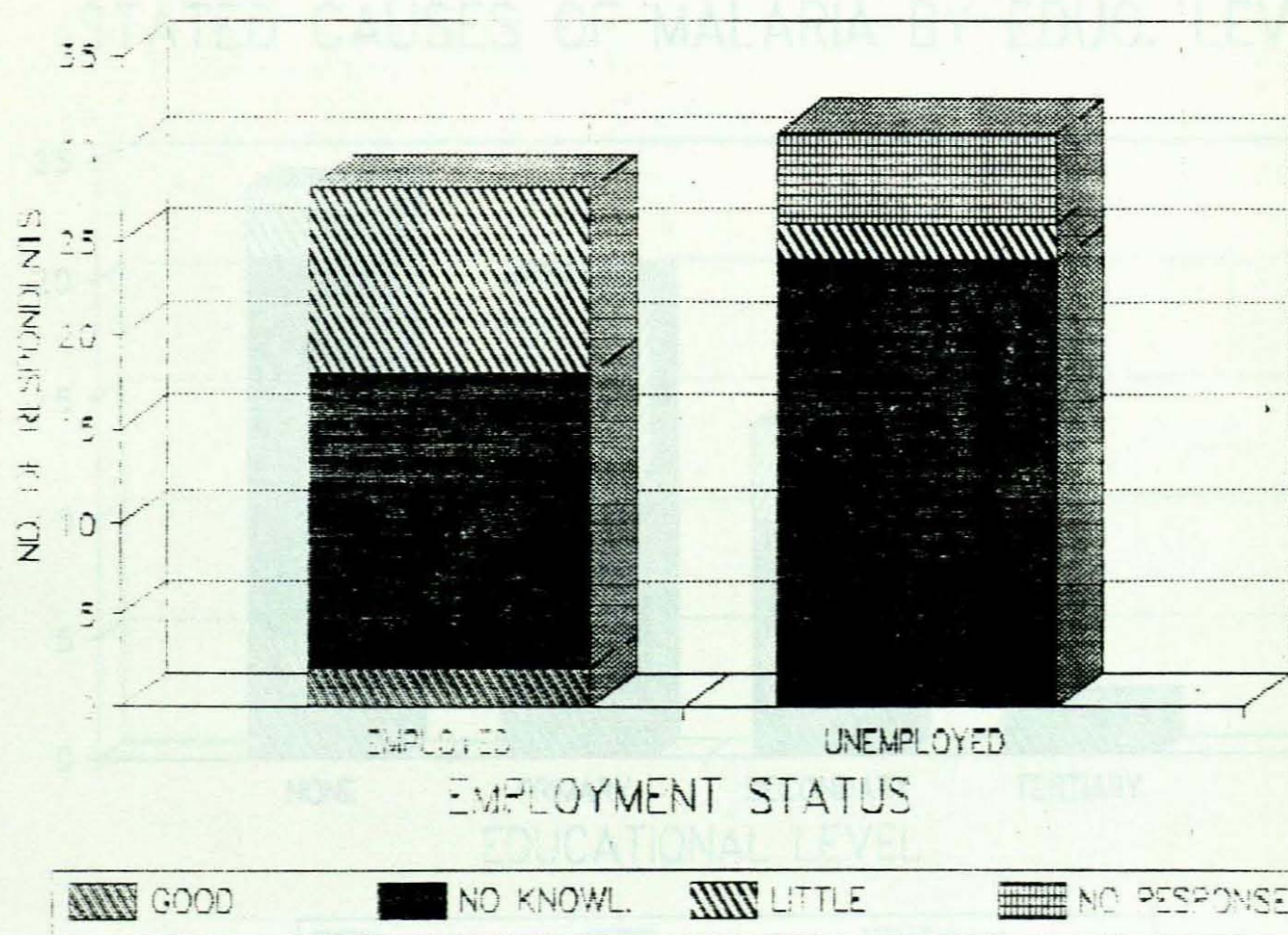


Fig. 4.9

## KNOWLEDG. OF TYPHOID CONTROL BY EMPLOY.



## KNOWLEDG. OF BILHARZ. CONTROL BY EMPLOY.





## STATED CAUSES OF MALARIA BY EDUC. LEVEL

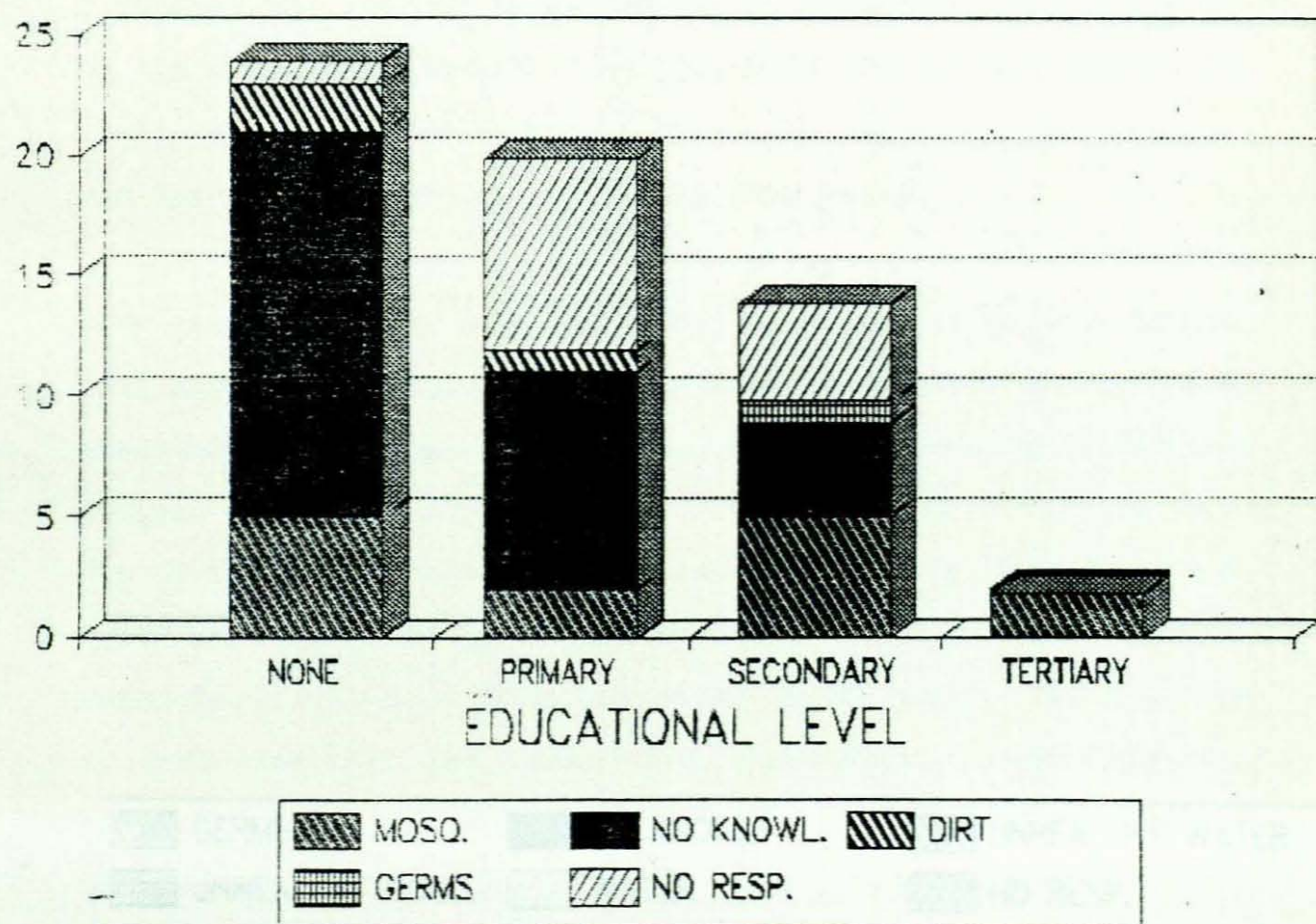
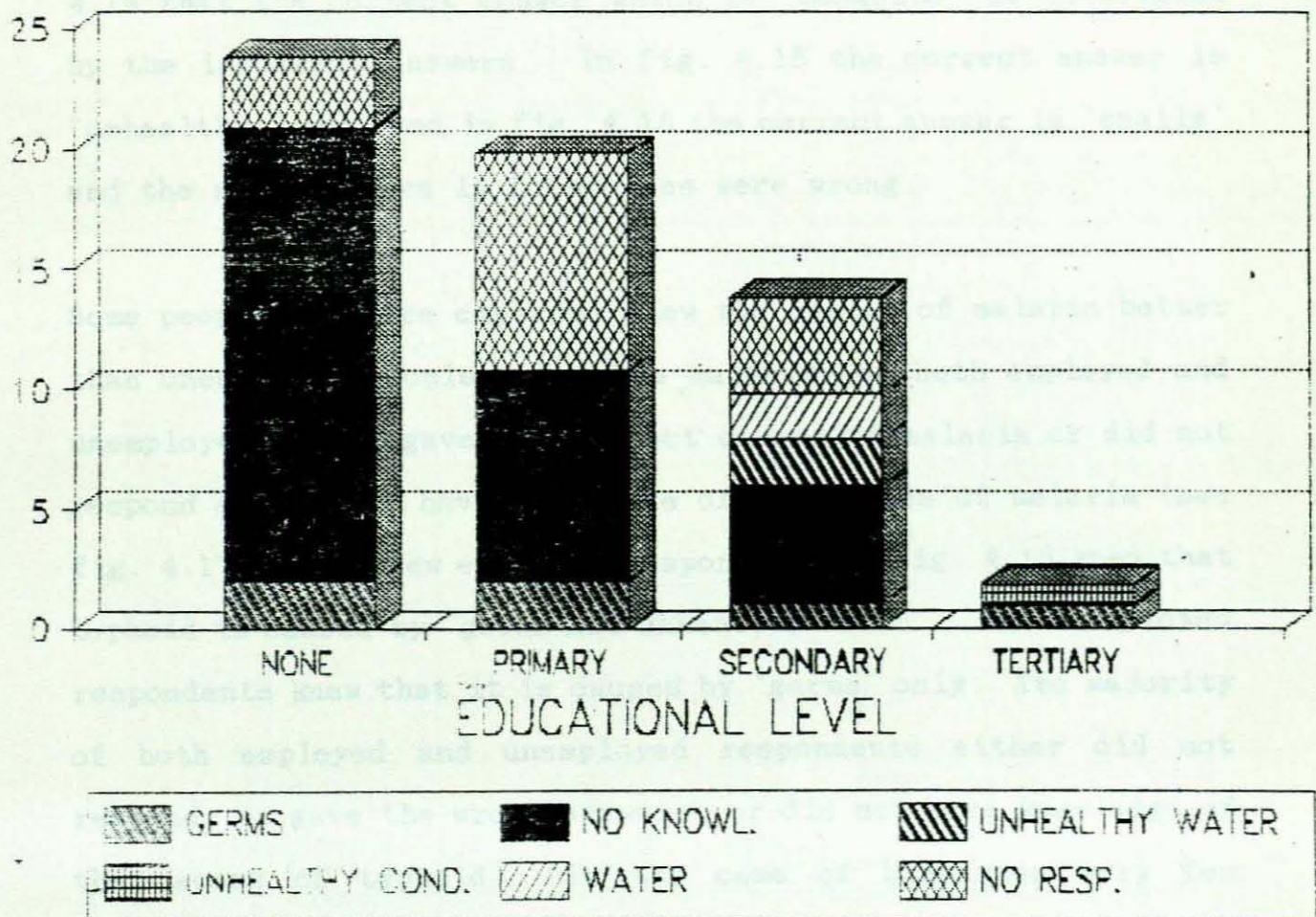


Fig. 4.12

# STATED CAUSES OF TYPHOID BY EDUC. LEVEL





in each educational level the majority of people had either given wrong answers or did not respond or did not have the knowledge on the causes of typhoid. In fig. 4.13 it was discovered that only people with tertiary level of education knew the correct causes of bilharzia which are the 'snails'.

In the case of residence, the people who did not know the causes of the diseases and who did not state them correctly were the people residing from both rural and peri-urban areas. (See fig. 4.14 that the correct answer which is 'mosquito' is outweighed by the incorrect answers. In fig. 4.15 the correct answer is "unhealthy water" and in fig. 4.16 the correct answer is 'snails' and the rest answers in both cases were wrong.

Some people who were employed knew the causes of malaria better than unemployed people. But the majority of both employed and unemployed either gave the correct causes of malaria or did not respond or did not have knowledge of the causes of malaria (see fig. 4.17). Some few employed respondents in fig. 4.18 knew that typhoid is caused by 'germs and unhealthy water'. Few unemployed respondents knew that it is caused by 'germs' only. The majority of both employed and unemployed respondents either did not respond, or gave the wrong answers, or did not have knowledge of the causes of typhoid. In the case of bilharzia very few employed respondents knew the causes of bilharzia as opposed to unemployed respondents who did not give even a single cause of bilharzia. The majority of employed people and the whole of unemployed respondents either gave wrong answers, did not respond

Fig. 4.13

## CAUSES OF BILHARZIA BY EDUC. LEVEL

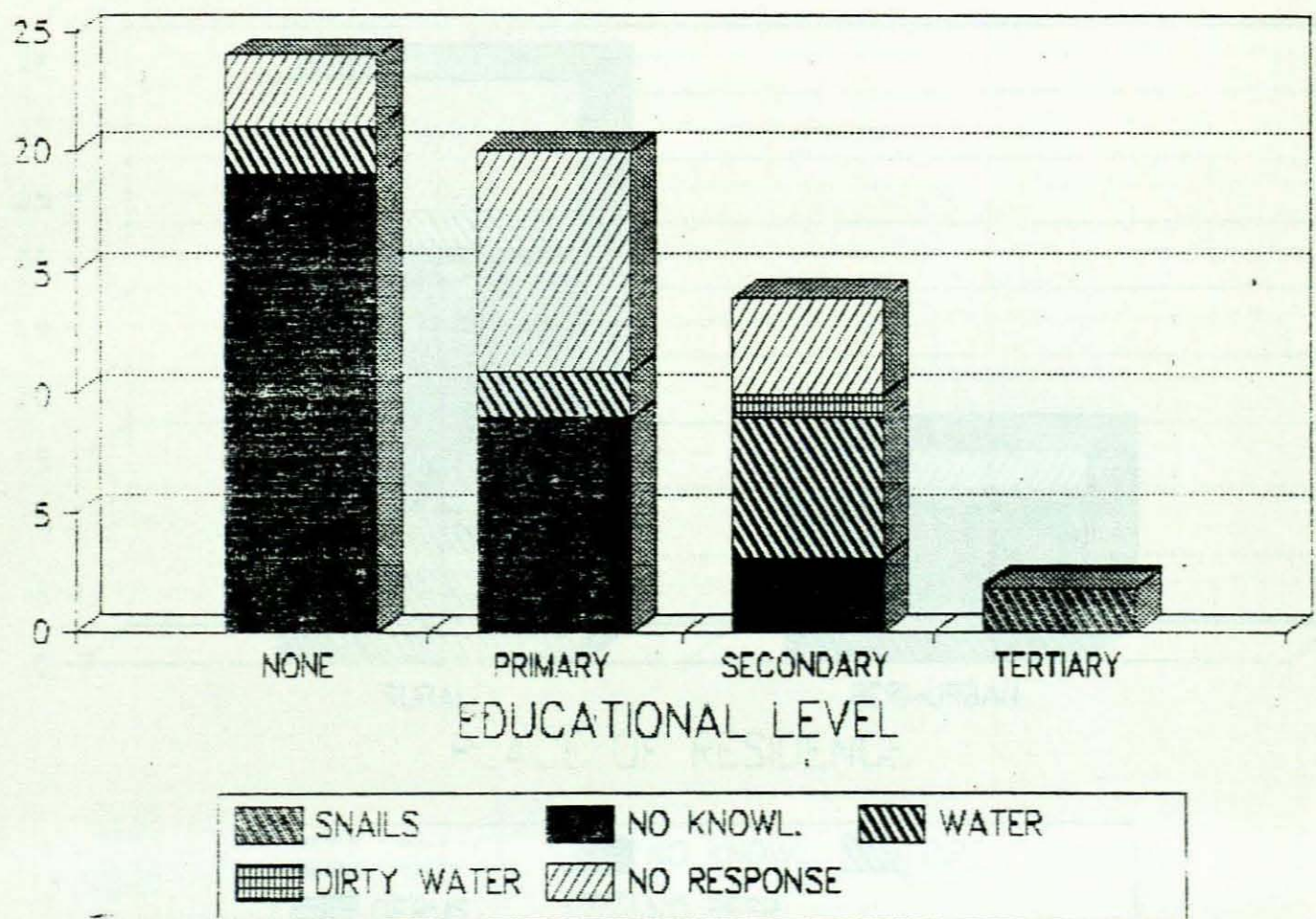
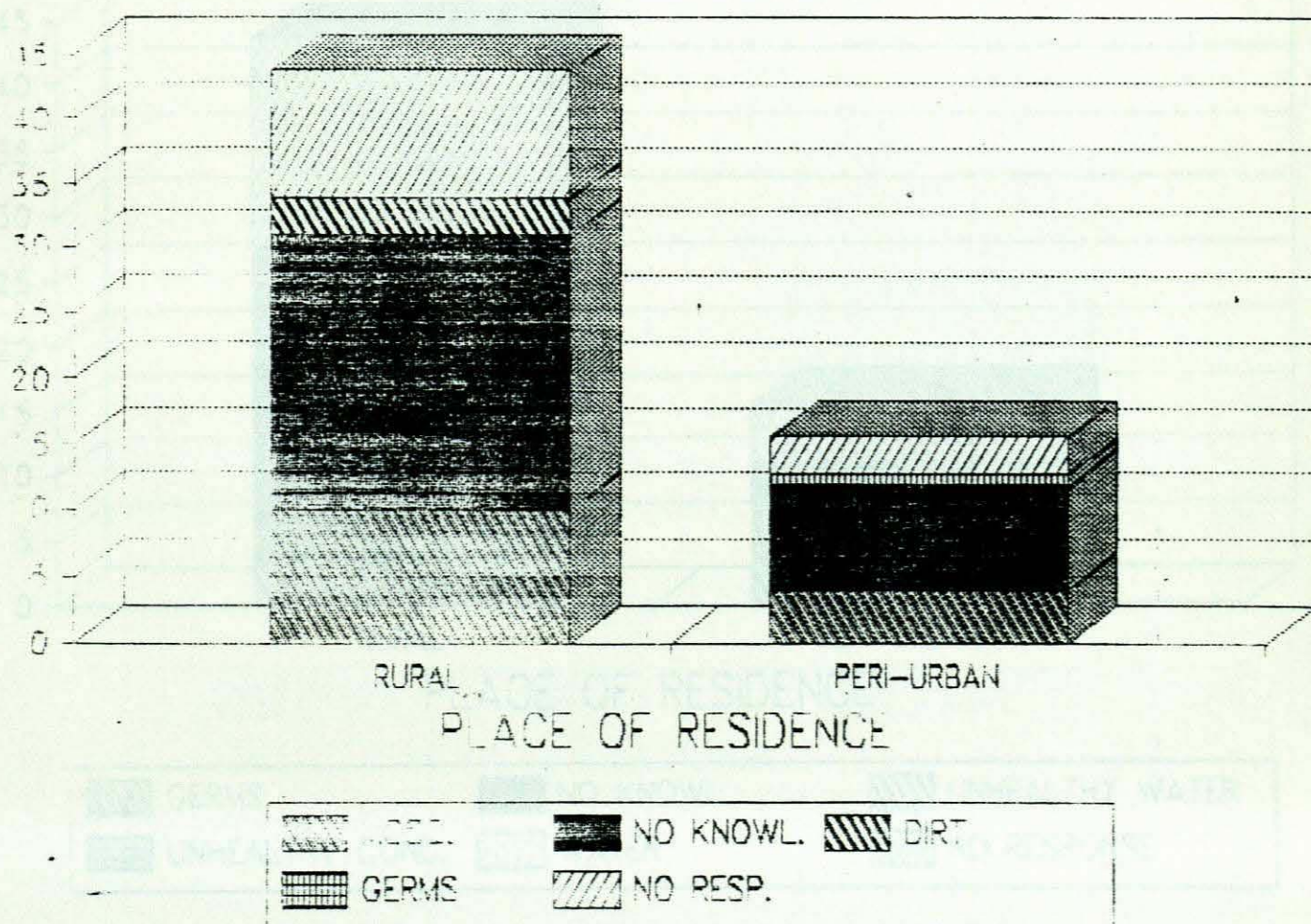


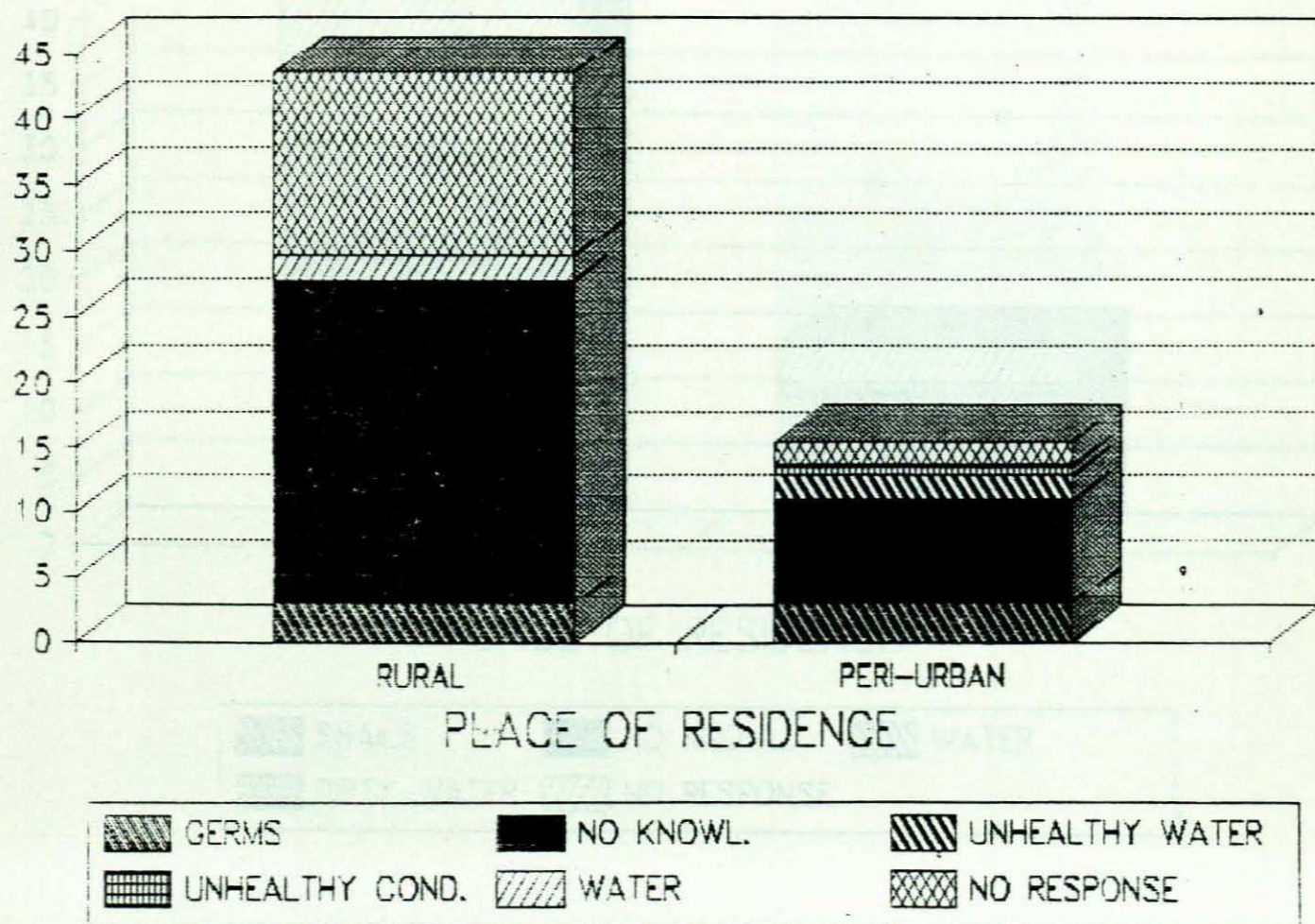


Fig. 4.14

## STATED CAUSES OF MALARIA BY RESIDENCE

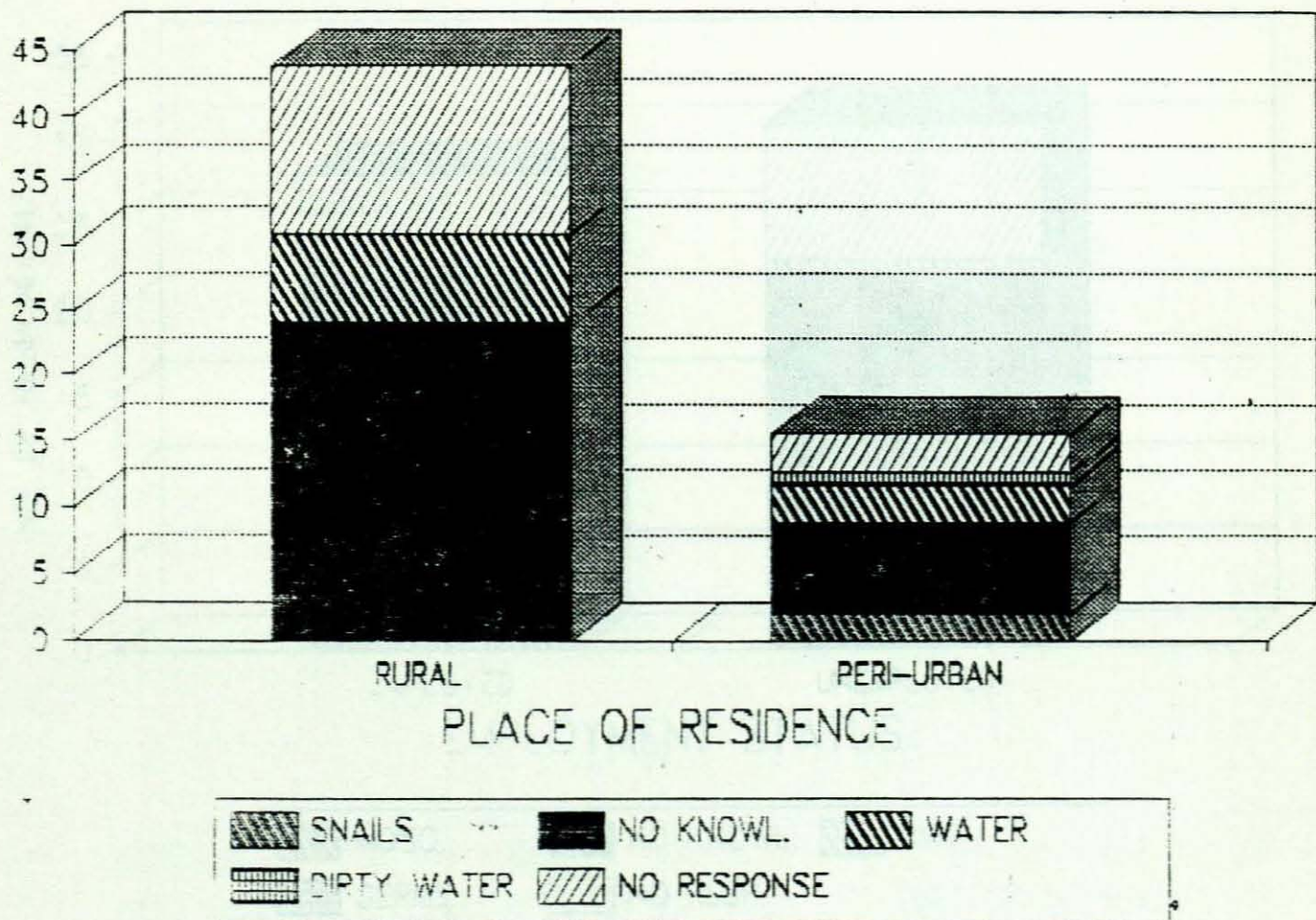


# STATED CAUSES OF TYPHOID BY RESIDENCE

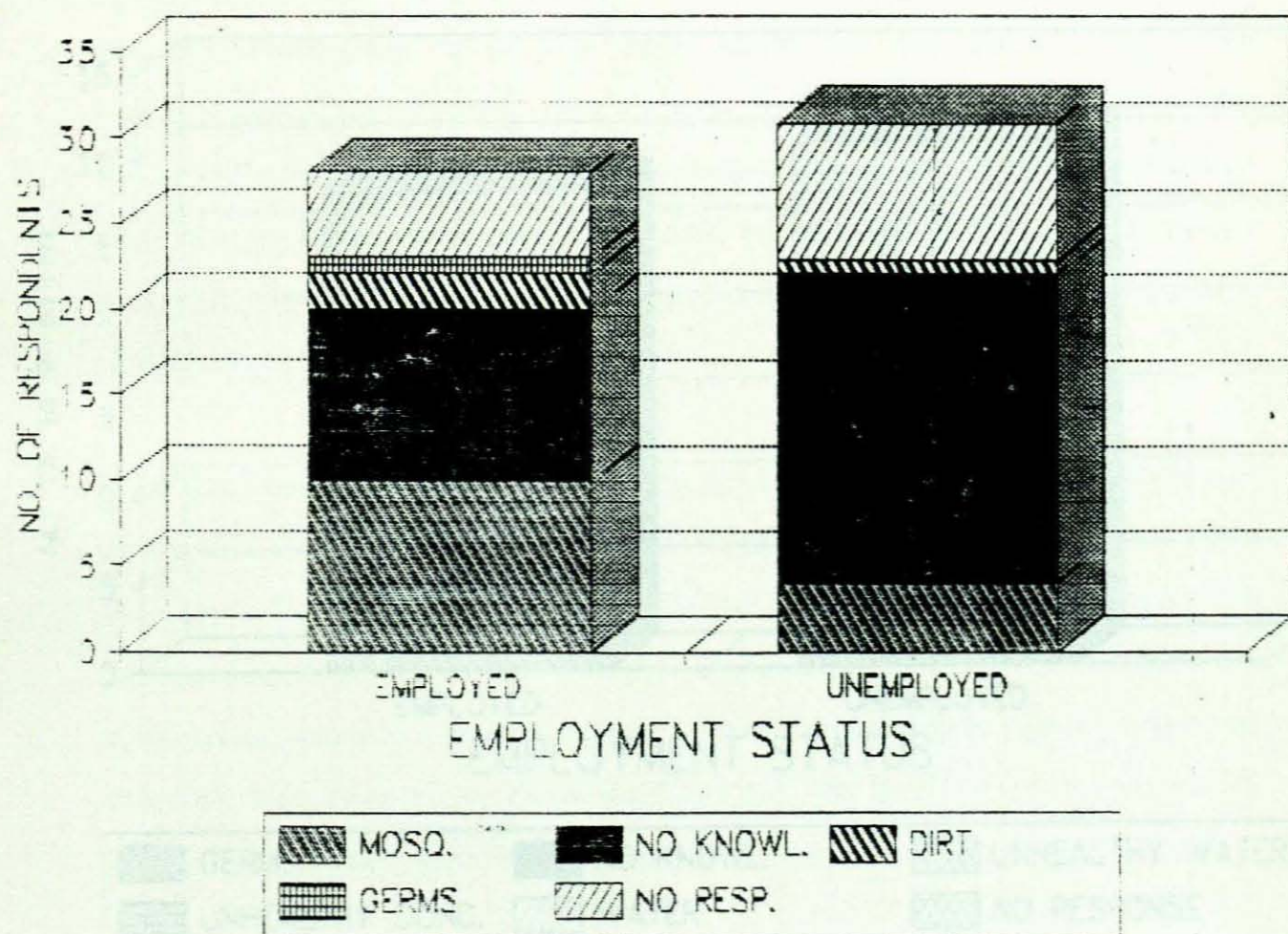




## STATED CAUSES OF BILHARZIA BY RESIDENCE

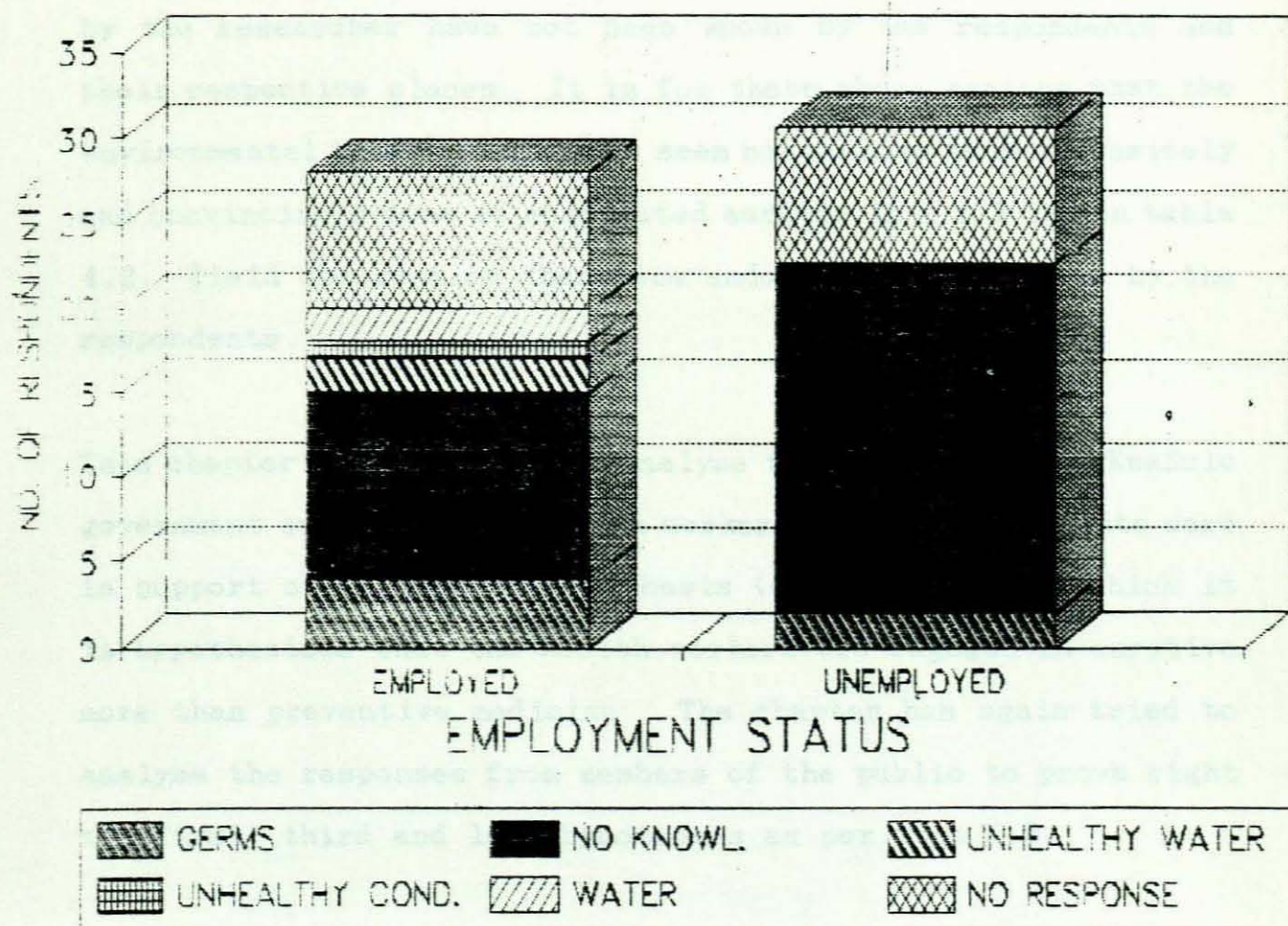


## STATED CAUSES OF MALARIA BY EMPLOYMENT





# STATED CAUSES OF TYPHOID BY EMPLOYMENT



or did not have knowledge of the causes of bilharzia (see fig. 4.19).

#### 4.5 SUMMARY AND CONCLUSION

It is now clear that environmental health programmes observed in item 4.2 were centralised in particular areas and not evenly distributed over the study area. That which have been observed by the researcher have not been known by the respondents and their respective places. It is for these above reasons that the environmental health programmes seem not to have been extensively and convincingly done as enunciated earlier in 4.2.3 and in table 4.2. Field observation therefore endorses the responses by the respondents.

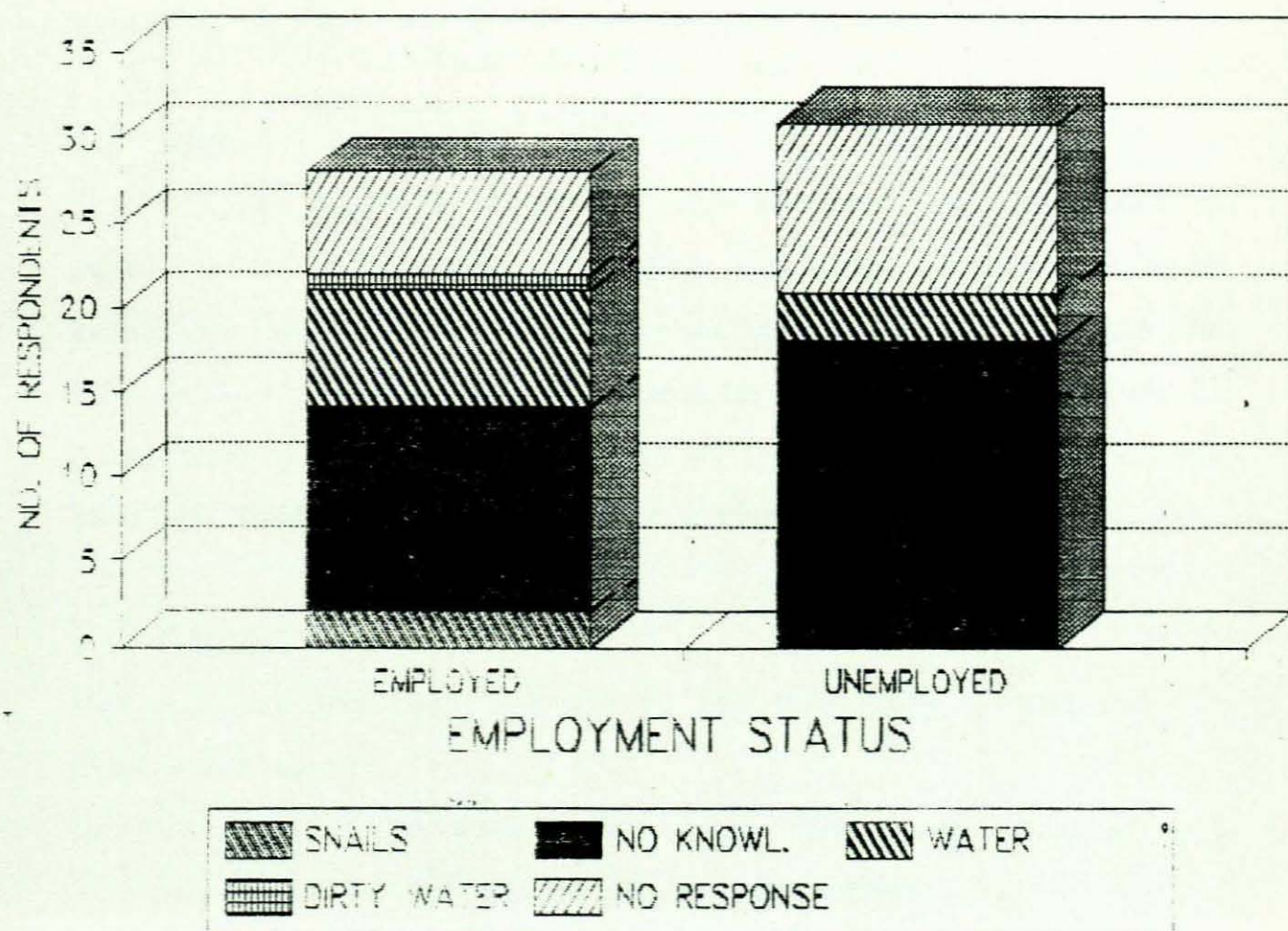
This chapter has attempted to analyse the responses from KwaZulu government environmental health workers. These respondents were in support of the second hypothesis (see item 1.6) in which it is hypothesized that the health workers are engaged in curative more than preventive medicine. The chapter has again tried to analyse the responses from members of the public to prove right the first, third and last hypotheses as per item 1.6.

This section of the research inquiry has been able to fullfil all its four aims as tabulated in item 1.3. It has been both the field observation, responses from the respondents and verbal communication (with health workers in the environmental health offices at Ngwelezane and in Jozini) which made it possible for the fullfilment of the aims.



Fig. 4.19

## STATED CAUSES OF BILHARZIA BY EMPLOYMNT



It is therefore proper that the recommendations in the following chapter five (5) ought to be based on these findings. Recommendations will be based in the sense that, they will have to take account of the shortcomings revealed by the field observation in conjunction with the lack of information (regarding disease control) deducted from the respondents.

### 5.2 AIMS

This chapter seeks to summarise all that has been discussed in this research inquiry. It will therefore recap upon very important items like the aims and the hypotheses of the study and the conclusions reached. This chapter will also have a general conclusion of the whole study. It will also have recommendations based on redressing inadequacies observed in the findings.

### 5.3 SUMMARY

The research has revealed how it has been able to address the aims which were:

- (a) To reveal the extent to which the three diseases are perceived to be related to the environment.
- (b) To reveal the extent to which the control measures against these diseases have an impact on the environmental occurrence of the same diseases.
- (c) To reveal whether or not the emerging pattern of the three diseases is related to community health programmes in place in the study area.



## CHAPTER 5

### SUMMARY, GENERAL CONCLUSION AND RECOMMENDATIONS

#### 5.1 INTRODUCTION

Since the three diseases are contracted through the environment, humans should take care not to interfere negatively with the environment. Such interference could cause an escalation in the severity of these three environmentally related diseases.

#### 5.2 AIMS

This chapter seeks to summarise all that has been discussed in this research inquiry. It will therefore touch upon very important items like the aims and the hypotheses of the study and the conclusions reached. This chapter will also have a general conclusion of the whole study. It will also have recommendations based on redressing inadequacies observed in the findings.

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- (c) To reveal whether or not the emerging pattern of the three diseases is related to community health programmes in place in the study area.

(d) To pinpoint some demographic variables that are related to the understanding of the occurrence of the three diseases in the study area.

Through these aims the study was able to show the relationship between the three diseases, their control measures and the environment.

The study has revealed how one hypothesis has been proven incorrect and other three correct. It has been seen how health personnel have in theory been engaged in preventive medicine, whereas in reality they are not so involved. This above dichotomy changes one of the hypotheses which has been proven incorrect to be proven correct.

For the study to meet its aims and for the hypotheses to be proven correct, it was through the findings. These findings were from the two sets of questionnaires, water sampling and field observation.

The recommendations and conclusions reached were trying to redress the inadequacies observed during the findings to make it possible for everyone to curb the spread of the three diseases.

#### 5.4 GENERAL CONCLUSION

From the analyses it has become apparent that the three diseases could still continue to exist as long as some control measures



are not adhered to. It has been clearly evidenced that both health workers and the communities in the study area do not practise the control measures adequately. The three environmentally related diseases have long been prevalent in the study area, perhaps this could apply in South Africa as a whole. On the basis of the findings of the study we should be talking now of supplementing the already existing and practised control measures. However, the study has concluded that we are still talking about the failure to practise the existing control measures. Furthermore, what has been observed is that the KwaZulu government continues to practise the long term preventive measures. While practising these measures, people have been found to continue being affected day after day.

The failure to control the environment has been the major contributory factor to the spread of the three environmentally related diseases. In most cases, the study established that although the general public and the health workers were aware of what is to be done to the environment to prevent the spread, nothing has been done.

As the general conclusions mentioned, are indicating a weakness in control procedures adopted by the authorities, it stands to reason that the usage 'shortage of resources' will not help improve the situation. Therefore the goals of the local authority's health programme will be difficult to achieve by the year 2000, by which time it is expected that every individual in rural environments should be talking health awareness.



## 5.5 RECOMMENDATIONS

Practising control measures against the three environmentally related diseases is an important and useful programme to engage in, if a better quality of life should be realised. Such a programme ought to be a joint effort between local communities and the KwaZulu government health practitioners. Virtually all of the preventive measures are expected to be practised by both these parties.

Ensuing from the relationships mentioned above the following recommendations can be made:

5.4.1 In view of the fact that the community-government relationship and delivery of the preventive measures is very successful, it is recommended that as a starting point, community involvement should be encouraged and controlled by establishing a community development committee. This committee should have substructures at local, tribal and regional levels.

5.4.2 On being established, these substructures should have authority to represent people in addressing their needs. It is expected that on complaining to the government about the shortage of health provision in their areas, these sub-structures would carry more weight than an ordinary practising health officer.

5.4.3 It is recommended that people on the ground should be made aware of the availability of control measures that do not require substantial funding in practising them. These are listed in the next table 5.1.



Table 5.1 : Preventive measures against the three environmentally related diseases

| Disease   | Prev. measures needing money                                                                                                                                         | Prev. measures - money not needed                                                                                                                                                                                                                                                                                                                                                                                                                     |
|-----------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Malaria   | <ol style="list-style-type: none"> <li>1. Mosquito sprays and repellants.</li> <li>2. Mosquito proof materials.</li> <li>3. Mosquito protective clothing.</li> </ol> | <ol style="list-style-type: none"> <li>1. Refrain from residing in malarious areas.</li> <li>2. Refrain from residing near water bodies and marshy areas.</li> <li>3. Avoid going at night in malarious areas.</li> <li>4. Blood testing.</li> <li>5. Mosquito large scale spraying is free of charge in malarious areas</li> </ol>                                                                                                                   |
| Typhoid   | <ol style="list-style-type: none"> <li>1. Spring protection and development.</li> </ol>                                                                              | <ol style="list-style-type: none"> <li>1. Avoid indiscriminate defecation near water sources.</li> <li>2. Construct toilets with cheap locally available materials. For example wattle and daub.</li> <li>3. Boil water before use.</li> <li>4. Rectal swabs/stools testing.</li> </ol>                                                                                                                                                               |
| Bilharzia | <ol style="list-style-type: none"> <li>1. Spring protection and development.</li> </ol>                                                                              | <ol style="list-style-type: none"> <li>1. Avoid indiscriminate defecation near water sources.</li> <li>2. Construct toilets with cheap locally available materials. For example wattle and daub.</li> <li>3. Immediately after crossing the river, wipe off with a cloth that portion of the body which was in contact with water.</li> <li>4. Avoid swimming in the infected water.</li> <li>5. Use spring water for washing and bathing.</li> </ol> |



5.4.4 As the KwaZulu government health practice is reported to have abandoned short term control measures like tracing the contacts/suspects of typhoid and bilharzia, it is recommended that the short term control measures be practised. The advantage of this move is that while the long term control measures have not been extended everywhere, to help people curb the three diseases, the short term control measures will help people who are getting sick and who need something to help them immediately.

5.4.5 In the case of bilharzia, though not notifiable and having unknown pattern, health practitioners and local community development structures should take initiatives to prevent the spread of the disease. To achieve this, it is recommended to intensify health education in all structures of the community like schools, churches, women organisations, agricultural clubs, sewing clubs, cultural movements and even political structures.

5.4.6 Since an information dissemination is important to all related diseases, it is recommended that after such information dissemination has been conducted, a survey has to be conducted to check whether the information on the control measures has reached every individuals in the study area. If it has not, further dissemination should take place until everybody is fully informed.

5.4.7 It is recommended that the government ought to finance the projects whereby surveys will be conducted by individuals or institutes repeatedly to check whether there has been any



pointable move towards adopting and practising the control measures against the three environmentally related diseases.

5.4.8 In the case of malaria, there were some cases that were reported in the 1989/90 period but such areas were never sprayed in the 1991/92 spraying season. It is recommended that if the areas with malaria cases can prove that they can harbour malaria carrying mosquitoes, spraying should also be extended to those area.

5.4.9 It is recommended that the responsibility to control malaria should be that of every government public health officer. Some health officers in the study area seem to be less concerned about the prevalence and pattern of malaria. They regard Jozini health office as solely responsible for malaria control.

5.4.10 In respect of instituting a viable health education programme, the following is recommended:

- (a) Both rural and peri-urban residences should be health educated simultaneously regarding the control of the three diseases, as they are both at a health risk for not knowing such control measures.
- (b) People with no formal education ought to be health-educated first. The findings have proved that respondents with no formal education lacked the information on the control of the three diseases more than those respondents with other levels of education.

- (c) Unemployed people should be health-educated first than employed people since unemployed respondents were the ones who, mostly, did not know the control measures.

## 5.6 CONCLUSION

This study has attempted to look at the manner in which the public and environmental health officers have influenced and contributed to the pattern and control of the three diseases in the study area. It is hoped that the findings in this study can be extended to other similar areas in the country for necessary corrective action and improvement to be effected. It is also hoped that in the 'New South Africa' more concern will be given to the practice of upgrading the environmental health status of the rural black people of the third world.

Since the subject is not a familiar one in the field of geography, it is however hoped that more research inquiry must be engaged into. This inquiry will form the basis for correcting the inadequacies of past practices as well as planning proficiency for the present and the future.



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QUESTIONNAIRE (MEMBERS OF THE PUBLIC)

Age

|                |    |
|----------------|----|
| 0 - 18         | 01 |
| 19 - 30        | 02 |
| 31 - 60        | 03 |
| 61 - and above | 04 |

Sex

|   |    |
|---|----|
| F | 01 |
| M | 02 |

Education

|                  |    |
|------------------|----|
| No formal        | 01 |
| Primary          | 02 |
| Secondary        | 03 |
| College and Tech | 04 |
| University       | 05 |

Resident

|            |    |
|------------|----|
| Rural      | 01 |
| Peri-urban | 02 |
| Urban      | 03 |

Are you working

|     |    |
|-----|----|
| Yes | 01 |
| No  | 02 |

What is your monthly salary

|               |    |
|---------------|----|
| R 50 - R 500  | 01 |
| R 501 - R2000 | 02 |
| R2001 - R5000 | 03 |
| R5001 - Over  | 04 |

Which of the following diseases do you think are endemic (or found) in your area

| Disease       | 01  | 02 |
|---------------|-----|----|
|               | Yes | No |
| (a) Malaria   |     |    |
| (b) Typhoid   |     |    |
| (c) Bilharzia |     |    |



- (a) What do you think causes malaria? .....  
.....  
.....
- (b) What do you think causes Typhoid? .....  
.....  
.....
- (c) What do you think causes bilharzia? .....  
.....  
.....

With the money you have, can you be able to prevent yourself from:

(a) Malaria

|     |  |    |
|-----|--|----|
| Yes |  | 01 |
| No  |  |    |

(b) Typhoid fever

|     |  |    |
|-----|--|----|
| Yes |  | 01 |
| No  |  | 02 |

(c) Bilharzia

|     |  |    |
|-----|--|----|
| Yes |  | 01 |
| No  |  | 02 |

10. Whose responsibility do you think it is to protect you against:

(a) Malaria fever

|            |  |    |
|------------|--|----|
| Mine       |  | 01 |
| Government |  | 02 |
| Community  |  |    |
| Don't know |  |    |

(b) Typhoid fever

|            |  |    |
|------------|--|----|
| Mine       |  | 01 |
| Government |  |    |
| Community  |  | 03 |
| Don't know |  | 04 |

(c) Bilharzia

|            |  |    |
|------------|--|----|
| Mine       |  | 01 |
| Government |  | 02 |
| Community  |  | 03 |
| Don't know |  | 04 |

11. Have you recently seen the KwaZulu Government employees spraying for mosquitoes in your area?

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

12. Do you know the control measures against

(a) Malaria fever

|            |    |
|------------|----|
| Yes        | 01 |
| No         | 02 |
| Little bit | 03 |

(b) Typhoid fever

|            |    |
|------------|----|
| Yes        | 01 |
| No         | 02 |
| Little bit | 03 |

(c) Bilharzia

|            |    |
|------------|----|
| Yes        | 01 |
| No         | 02 |
| Little bit | 03 |

13. Do you think this spraying has been effective in removing malaria fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

14. Have you recently seen the KwaZulu Government employees supplying clean water in your area?

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

15. Do you keep and use clean water at all times?

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

16. Have you recently seen the KwaZulu Government employees providing toilets in your area?

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |



17. Did you build your own toilet?

|     |    |
|-----|----|
| Yes | 01 |
| No  | 02 |

18. Have you recently seen the KwaZulu Government employees trapping snails from the rivers?

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

19. Have you practised or used the control measures against

(a) Malaria fever

|            |    |
|------------|----|
| Yes        | 01 |
| No         | 02 |
| Little bit | 03 |

(b) Typhoid fever

|            |    |
|------------|----|
| Yes        | 01 |
| No         | 02 |
| Little bit | 03 |

(c) Bilharzia

|            |    |
|------------|----|
| Yes        | 01 |
| No         | 02 |
| Little bit | 03 |

20. Have you ever been threatened with arrest for not practising the control measures against

(a) Malaria fever

|     |    |
|-----|----|
| Yes | 01 |
| No  | 02 |

(b) Typhoid fever

|     |    |
|-----|----|
| Yes | 01 |
| No  | 02 |

(c) Bilharzia

|     |    |
|-----|----|
| Yes | 01 |
| No  | 02 |

21. Do you think you could be infected by

(a) Malaria fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(b) Typhoid fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(c) Bilharzia

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

22. When infected with the above diseases where would you get assistance from?

|                          |    |
|--------------------------|----|
| Myself                   | 01 |
| Clinic/Hospital          | 02 |
| Inyanga                  | 03 |
| Chemist                  | 04 |
| Community Health Workers | 05 |
| Neighbour                | 06 |
| Not sure                 | 07 |

23. Have you recently seen a community Health Worker in your area?

|     |    |
|-----|----|
| Yes | 01 |
| No  | 02 |

24. How often have you seen some?

|            |    |
|------------|----|
| Very often | 01 |
| Not often  | 02 |
| Never      | 03 |

Thank you very much for your co-operation.

(a) Malaria fever

|           |    |
|-----------|----|
| Yes       | 01 |
| No        | 02 |
| Sometimes | 03 |

(b) Typhoid fever

|           |    |
|-----------|----|
| Yes       | 01 |
| No        | 02 |
| Sometimes | 03 |

(c) Bilharzia

|           |    |
|-----------|----|
| Yes       | 01 |
| No        | 02 |
| Sometimes | 03 |



22. When infected with the above diseases where would you get assistance from?

|                          |    |
|--------------------------|----|
| Myself                   | 01 |
| Clinic/Hospital          | 02 |
| Inyanga                  | 03 |
| Chemist                  | 04 |
| Community Health Workers | 05 |
| Neighbour                | 06 |
| Not sure                 | 07 |

23. Have you recently seen a community Health Worker in your area?

|     |    |
|-----|----|
| Yes | 01 |
| No  | 02 |

24. How often have you seen some?

|            |    |
|------------|----|
| Very often | 01 |
| Not often  | 02 |
| Never      | 03 |

Thank you very much for your co-operation.

QUESTIONNAIRE (HEALTH OFFICERS)

What organisation or body are you serving under?

|                                          |    |
|------------------------------------------|----|
| S.A. Government                          | 01 |
| KwaZulu Government                       | 02 |
| Matigulu P.H.C Centre                    | 03 |
| Institute of tropical diseases           | 04 |
| Private Company                          | 05 |
| Non-profit organization e.g<br>Red Cross | 06 |
| Others (specify).....                    | 07 |

2. What is your occupation? .....

3. What type of health/medicinal programme are you engaged in?

|                        |    |
|------------------------|----|
| Curative medicine      | 01 |
| Preventive medicine    | 02 |
| Primary Health Care    | 03 |
| Others (specify) ..... | 04 |

Do you trace and investigate the contacts and suspects of

(a) Malaria fever

|           |    |
|-----------|----|
| Yes       | 01 |
| No        | 02 |
| Sometimes | 03 |

(b) Typhoid fever

|           |    |
|-----------|----|
| Yes       | 01 |
| No        | 02 |
| Sometimes | 03 |

(c) Bilharzia

|           |    |
|-----------|----|
| Yes       | 01 |
| No        | 02 |
| Sometimes | 03 |

5. What could be the reason in cases of answering "no" and "sometimes" in 4 above .....

In case of answering "yes" in 4 above, what strategies do you actually use in the case of:



(a) Malaria fever

|                                                                 |   |
|-----------------------------------------------------------------|---|
| Treat the contacts and suspects                                 | 0 |
| Take bloodsmears from the contacts and suspects for examination | 0 |
| Environmental treatment                                         | 0 |
| Spray mosquitoes                                                | 0 |
| Health educate                                                  | 0 |
| Institute legal action                                          | 0 |
| Others (specify).....                                           | 0 |

(b) Typhoid fever

|                                                                             |    |
|-----------------------------------------------------------------------------|----|
| Treat the contacts and suspects                                             | 01 |
| Take rectal swabs from the contacts and suspects for laboratory examination | 02 |
| Environmental treatment                                                     | 03 |
| Take water samples for examination                                          | 04 |
| Health educate                                                              | 05 |
| Institute legal action                                                      | 06 |
| Others (specify) .....                                                      | 07 |

(c) Bilharzia

|                                 |    |
|---------------------------------|----|
| Treat the contacts and suspects | 01 |
| Take urine and stools samples   | 02 |
| Environmental treatment         | 03 |
| Trap snails                     | 04 |
| Health educate                  | 05 |
| Institute legal action          | 06 |
| Others (specify).....           | 07 |

7. In the control of the three diseases, what do you usually treat?

|                       |    |
|-----------------------|----|
| Environment           | 01 |
| Patients              | 02 |
| Contacts and suspects | 03 |
| Others (specify)..... | 04 |

8. In treating the environment what physical features have you had occass to work on

3/.....

(a) For Malaria fever

|                       |   |
|-----------------------|---|
| River water           | 0 |
| Dam/pond water        | 0 |
| Spring water          | 0 |
| Vegetation            | 0 |
| Soil                  | 0 |
| Vectors/carriers      | 0 |
| Buildings             | 0 |
| Refuse dumps          | 0 |
| Others (specify)..... | 0 |

(B) For Typhoid fever

|                       |   |
|-----------------------|---|
| River water           | 0 |
| Dam/pond water        | 0 |
| Spring water          | 0 |
| Vegetation            | 0 |
| Soil                  | 0 |
| Vectors/carriers      | 0 |
| Buildings             | 0 |
| Refuse dumps          | 0 |
| Others (specify)..... | 0 |

(c) For bilharzia

|                        |    |
|------------------------|----|
| River water            | 01 |
| Dam/pond water         | 02 |
| Spring water           | 03 |
| Vegetation             | 04 |
| Soil                   | 05 |
| Vectors/carries        | 06 |
| Buildings              | 07 |
| Refuse dumps           | 08 |
| Others (specify) ..... | 09 |

9. How successful is your health education?

|                         |    |
|-------------------------|----|
| Always successful       | 01 |
| Occasionally successful | 02 |
| Never successful        | 03 |
| Still to be attempted   | 04 |
| Don't know              | 05 |



Have the strategies of controlling the three diseases changed from those previously used?

(a) Malaria fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(b) Typhoid fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(c) Bilharzia

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

Are the present strategies used, the cause of failure to control the pattern of these diseases?

(a) Malaria fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(b) Typhoid fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(c) Bilharzia

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

If the present strategies used are not responsible for the failure to control these diseases, what then causes such failure to control;

- (a) Malaria fever .....
- .....
- .....
- (b) Typhoid fever .....
- .....
- .....
- (c) Bilharzia .....
- .....
- .....

Are the diseases still spreading more than a decade or so, ago?

(a) Malaria fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(b) Typhoid fever

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

(c) Bilharzia

|          |    |
|----------|----|
| Yes      | 01 |
| No       | 02 |
| Not sure | 03 |

**ANNEXURE B.1****AREAS WITH MALARIA AND TYPHOID CASES (1989-1990)**

Numerical numbers represent the areas on the map in Annexure 8.2

|     |             |                   |
|-----|-------------|-------------------|
| 1.  | Chwezi :    | Nkandla district  |
| 2.  | Ohlelo      | " "               |
| 3.  | Thaleni     | " "               |
| 4.  | Ngwegweni   | " "               |
| 5.  | Ntingwe     | " "               |
| 6.  | Vumanhlamvu | " "               |
| 7.  | Ntumeni :   | Nkanyezi district |
| 8.  | Mpofu       | " "               |
| 9.  | Vuma        | " "               |
| 10. | Nkanini     | " "               |
| 11. | Samungu     | " "               |
| 12. | Khangelani  | " "               |
| 13. | Mpofana     | " "               |
| 14. | Hlungwini   | " "               |
| 15. | Dendethu    | " "               |
| 16. | Mandeni     | " "               |
| 17. | Mathonsi    | " "               |
| 18. | Sundumbili  | " "               |
| 19. | Nyoni       | " "               |
| 20. | Vutha       | " "               |
| 21. | Ndulinde    | " "               |
| 22. | Mombeni     | " "               |
| 23. | Ngogo       | " "               |
| 24. | Mpushini    | " "               |
| 25. | Dikinyana   | " "               |

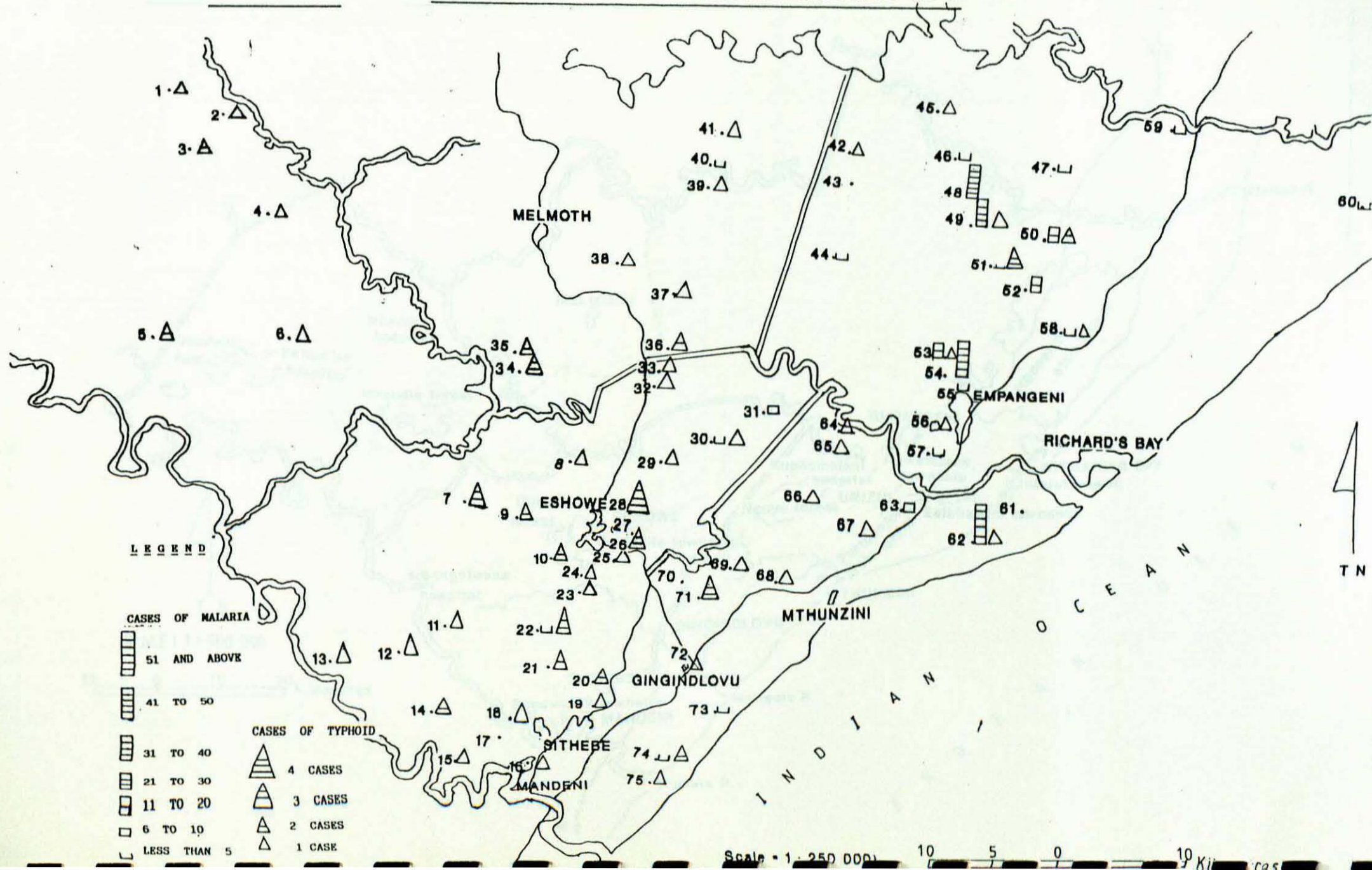


|     |              |                     |   |
|-----|--------------|---------------------|---|
| 26. | Nyanini      | "                   | " |
| 27. | Gezinsila    | "                   | " |
| 28. | Mlalazi      | "                   | " |
| 29. | Habeni       | "                   | " |
| 30. | Maqhwakazi   | "                   | " |
| 31. | Ndlangubo    | "                   | " |
| 32. | Nkwalini     | : Enseleni district |   |
| 33. | Bedlana      | "                   | " |
| 34. | Kuthuleni    | "                   | " |
| 35. | Mfanefile    | "                   | " |
| 36. | Ndundulu     | "                   | " |
| 37. | Nomponjwana  | "                   | " |
| 38. | Makhasaneni  | "                   | " |
| 39. | Mshwaneni    | "                   | " |
| 40. | Matshamnyama | "                   | " |
| 41. | Mawanda      | "                   | " |
| 42. | Bhiliya      | "                   | " |
| 43. | Mkhandlwini  | "                   | " |
| 44. | Ntambanana   | "                   | " |
| 45. | Ndondwana    | "                   | " |
| 46. | Fuyeni       | "                   | " |
| 47. | Ntobozi      | "                   | " |
| 48. | Sabhuza      | "                   | " |
| 49. | -Dondotha    | "                   | " |
| 50. | Mbabe        | "                   | " |
| 51. | Mabhuyeni    | "                   | " |
| 52. | Cwaka        | "                   | " |
| 53. | Macekane     | "                   | " |

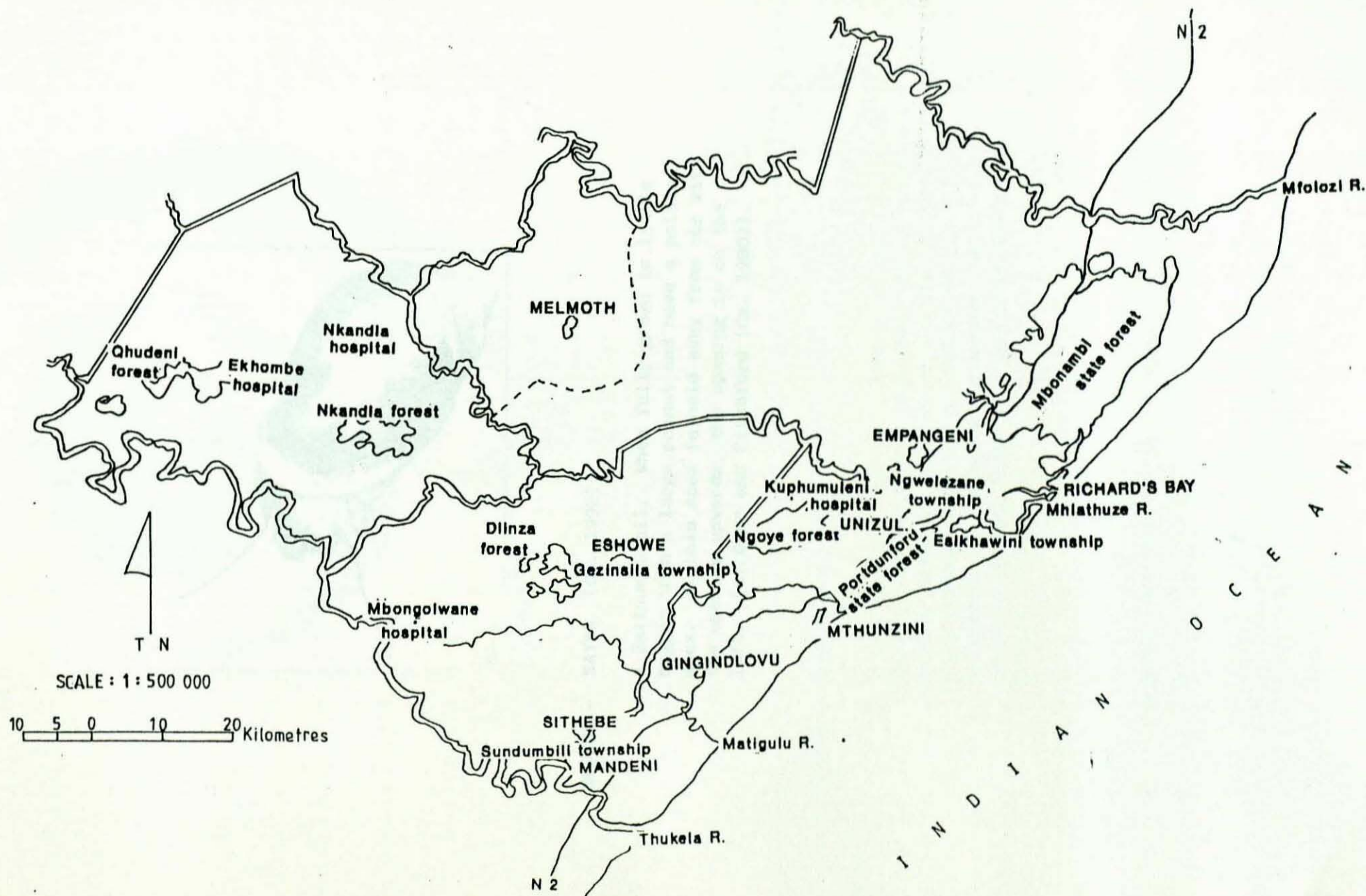
|                  |                    |
|------------------|--------------------|
| 54. Mevamlhlophe | " "                |
| 55. Empangeni    | " "                |
| 56. Ngwelezane   | " "                |
| 57. Ndabayakhe   | " "                |
| 58. Ovondlo      | " "                |
| 59. Nhlabosini   | " "                |
| 60. Sokhulu      | " "                |
| 61. Mpembeni :   | Ongoye district    |
| 62. Esikhawini   | " "                |
| 63. Dlangezwa    | " "                |
| 64. Kuphumuleni  | " "                |
| 65. Nteneshane   | " "                |
| 66. Manzamnyama  | " "                |
| 67. Nsiwa        | " "                |
| 68. Obanjeni     | " "                |
| 69. Mkhukhuze :  | Inkanyezi district |
| 70. Wombane      | " "                |
| 71. Mvutshini :  | Ongoye district    |
| 72. Gingindlovu  | " "                |
| 73. Dokodweni    | " "                |
| 74. Matikulu     | " "                |
| 75. Lambothi     | " "                |



## AREAS WITH MALARIA AND TYPHOID - CASES (1989-1990)



## SOME PHYSICAL FEATURES IN THE STUDY AREA.

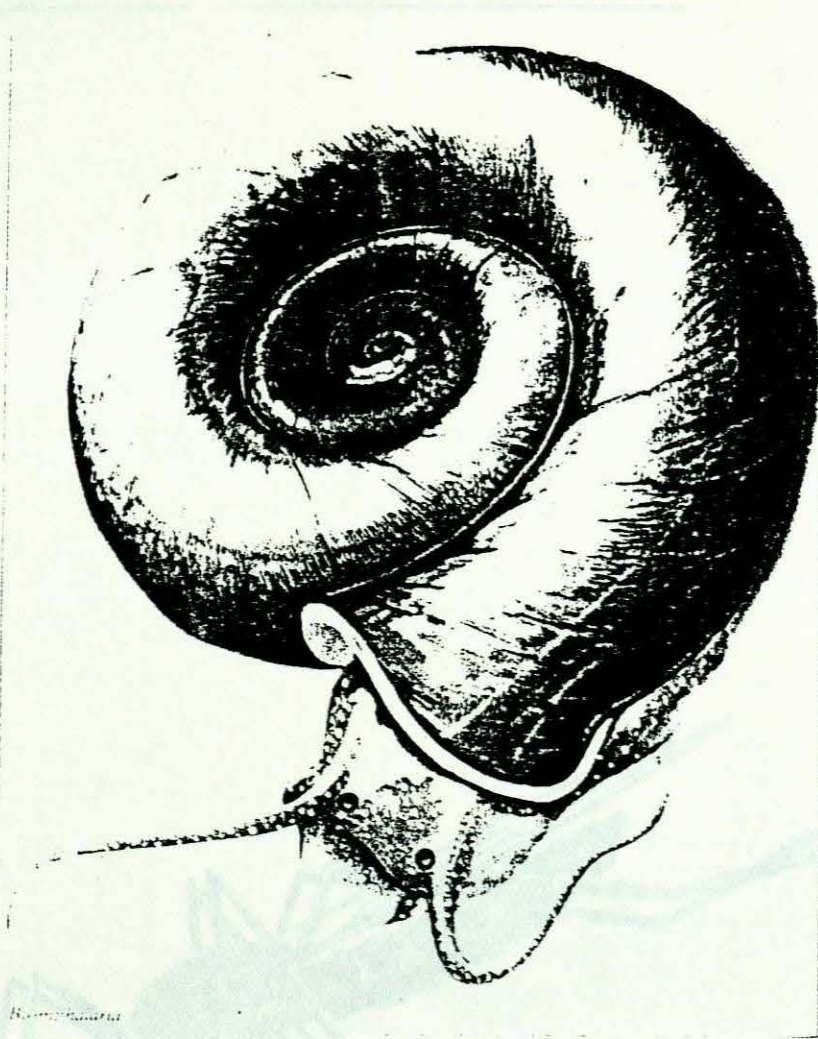






SOURCE:- BAYER (Ca. 1992)

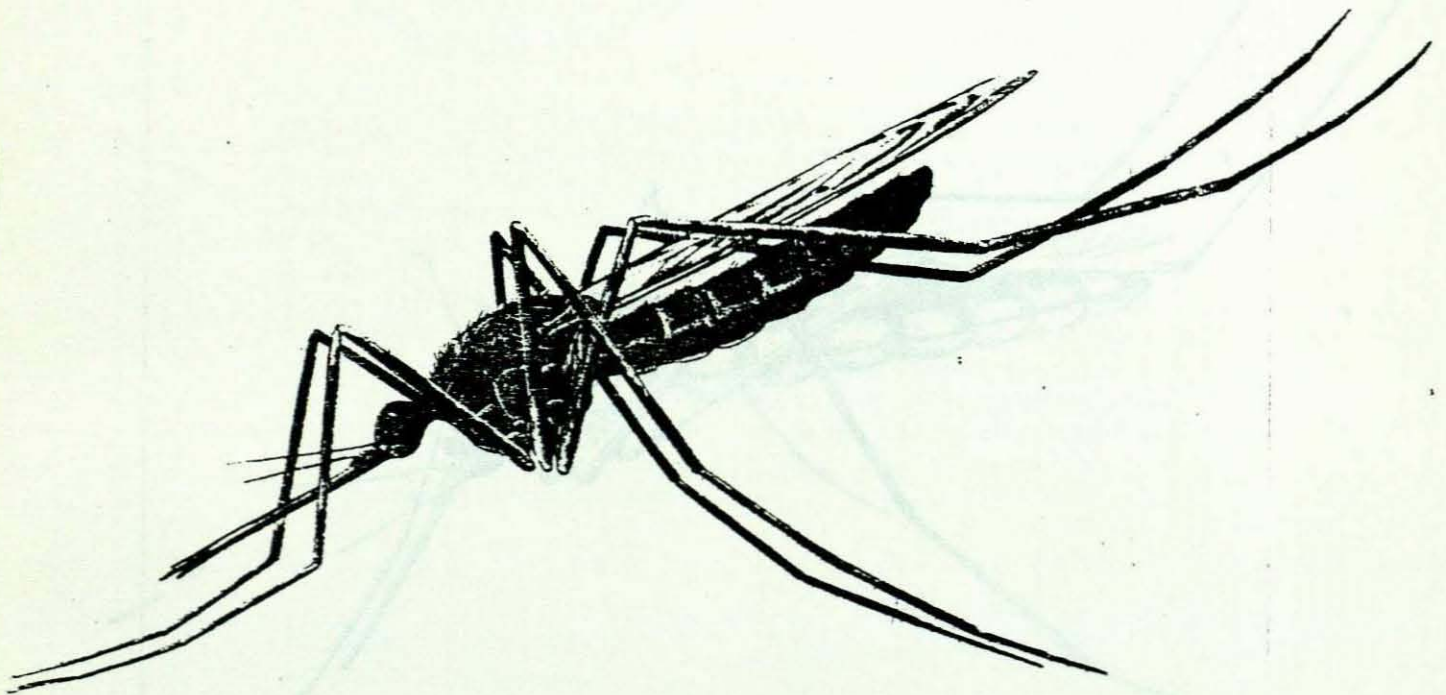
A Balinus Snail. When fully grown is little bigger than a large peanut and have a pointed apex. If this apex is held away from one with the opening upwards, the opening is on the left. (cf. Gear and Pitchford (Ca. 1980)).



SOURCE:- BAYER (Ca. 1992)

A Biomphalaria Snail. A flat orbbed snail the apex of which is central and not seen. It is a little smaller than the diameter of a 5 cent piece when fully grown. (cf. Gear and Pitchford (Ca. 1980)). It harbours the schistosoma mansoni which is the parasite causing intestinal schistosomiasis (Bilharzia) in man.

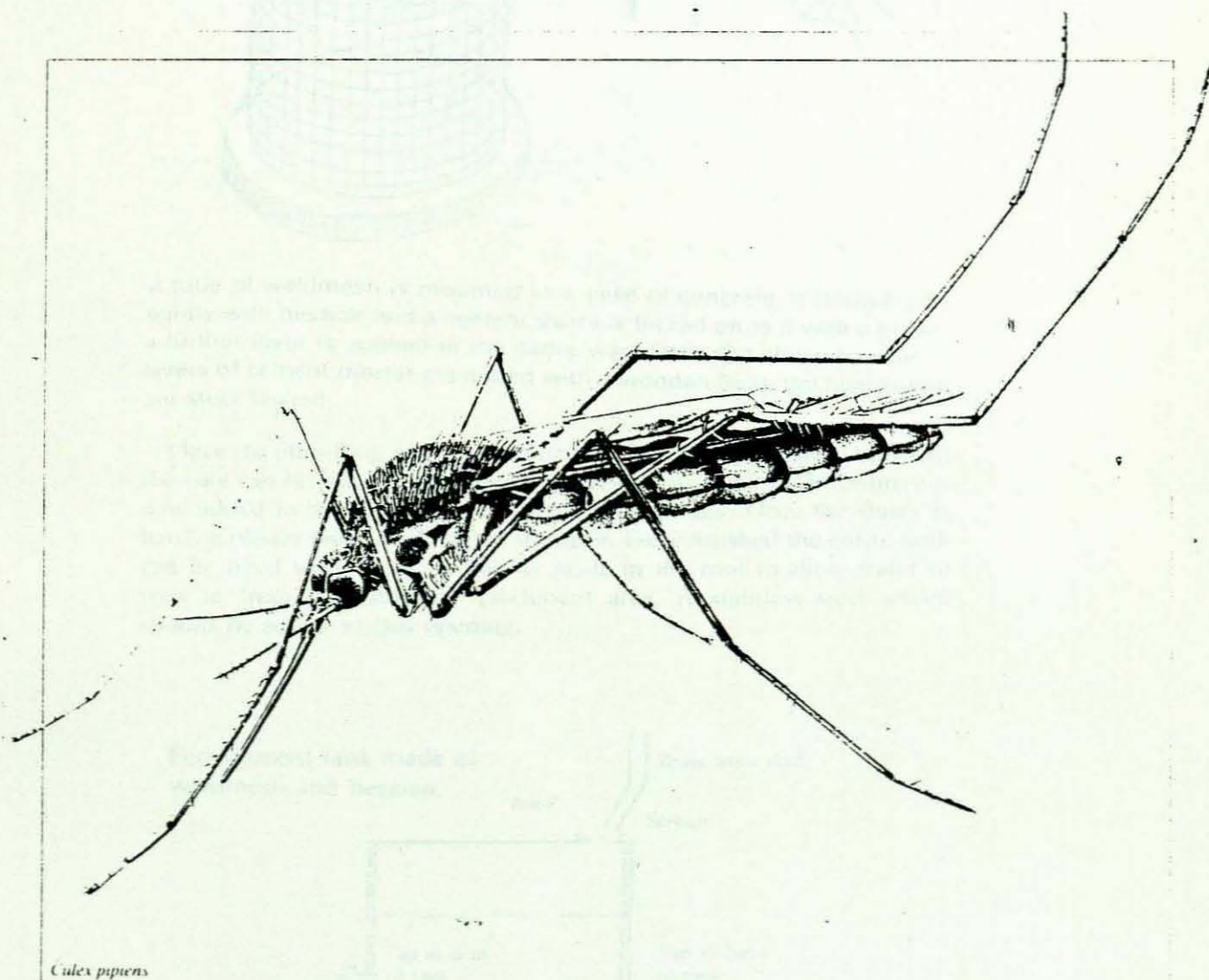




*Anopheles maculipennis*

SOURCE:- BAYER (Ca. 1992)

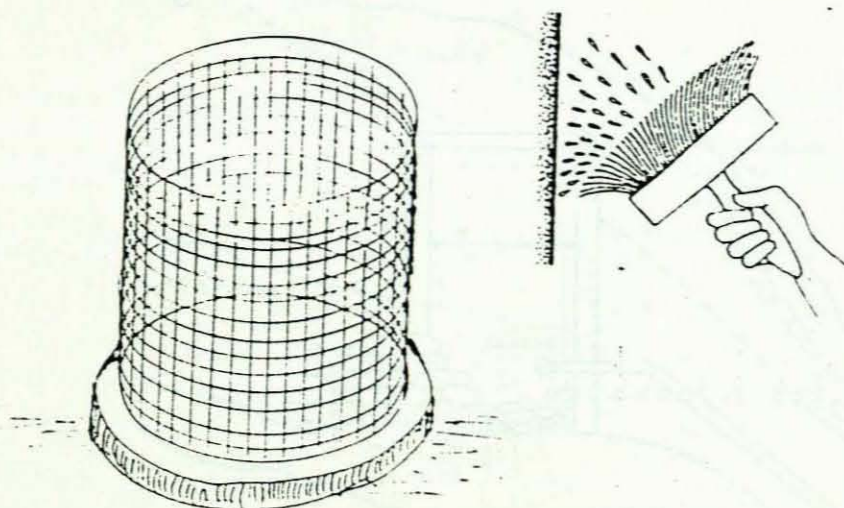
Malaria carrying mosquito - characterized by their elongated body which they hold at a downward angle relative to the resting surface.



SOURCE:- BAYER (Ca. 1992)

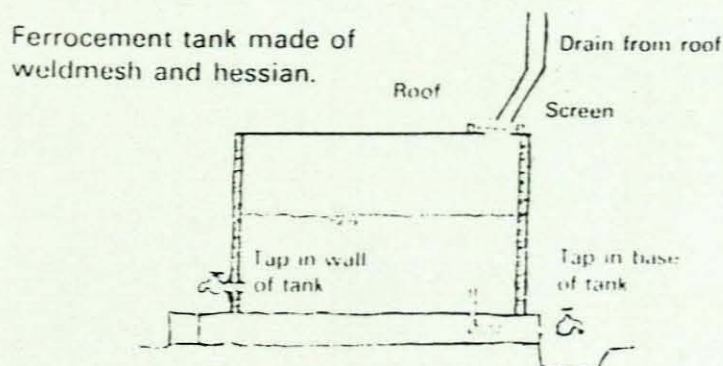
Non-Malaria carrying mosquito - characterized by the body which is held parallel to the resting surface.





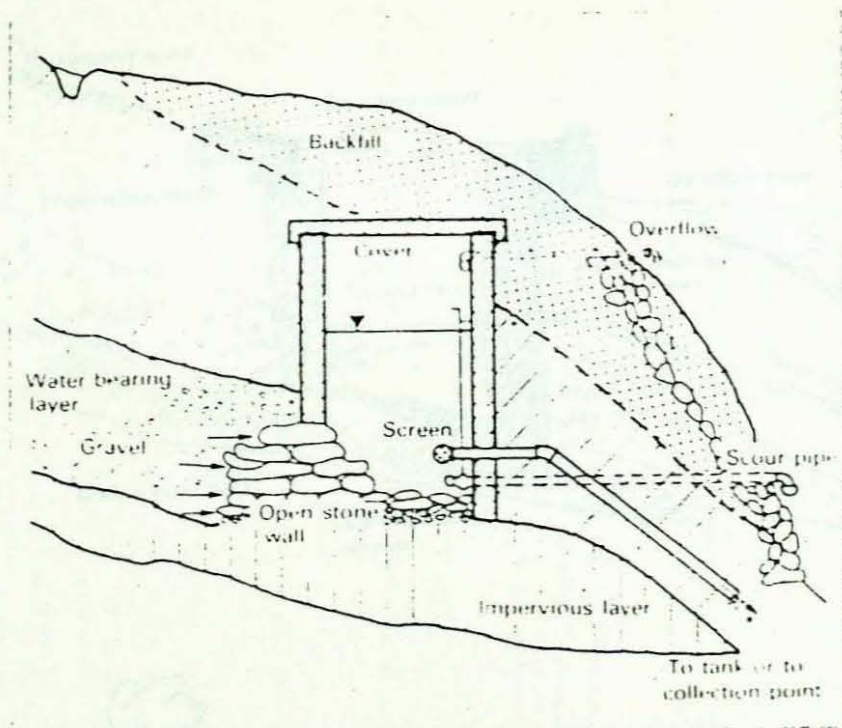
A tube of weldmesh is mounted in a base of concrete, it is covered tightly with hessian and a cement slurry is flicked on to it with a brush, a further layer is applied in the same way. Once the slurry has set, layers of cement mortar are added with a wooden float, the final layers are steel floated.

Once the plumbing and interior surface of the tank have been finished, the roof can be placed in position and secured with wire. More slurry is now added to the roof as it was added to the walls. Once the slurry is hard, a plaster layer is added for strength. Once finished the entire tank can be filled with water. A hole is made in the roof to allow water to pass in from the rainwater catchment area. A stainless steel screen should be added to this opening.



SOURCE:- MORGAN, P. (1990: 231)

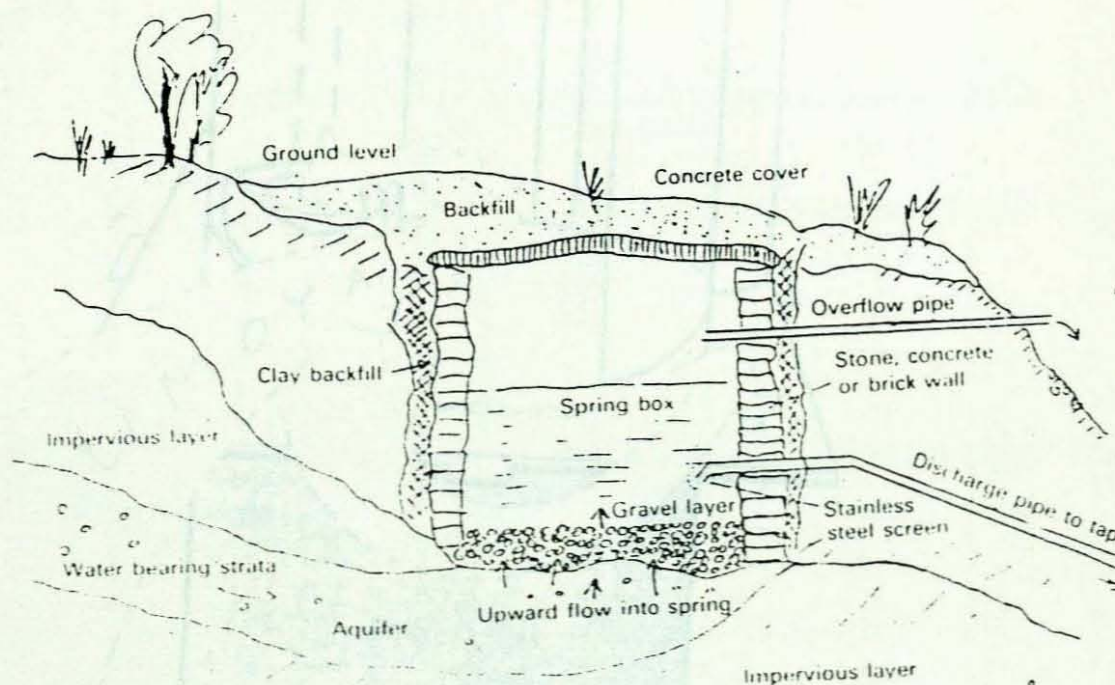
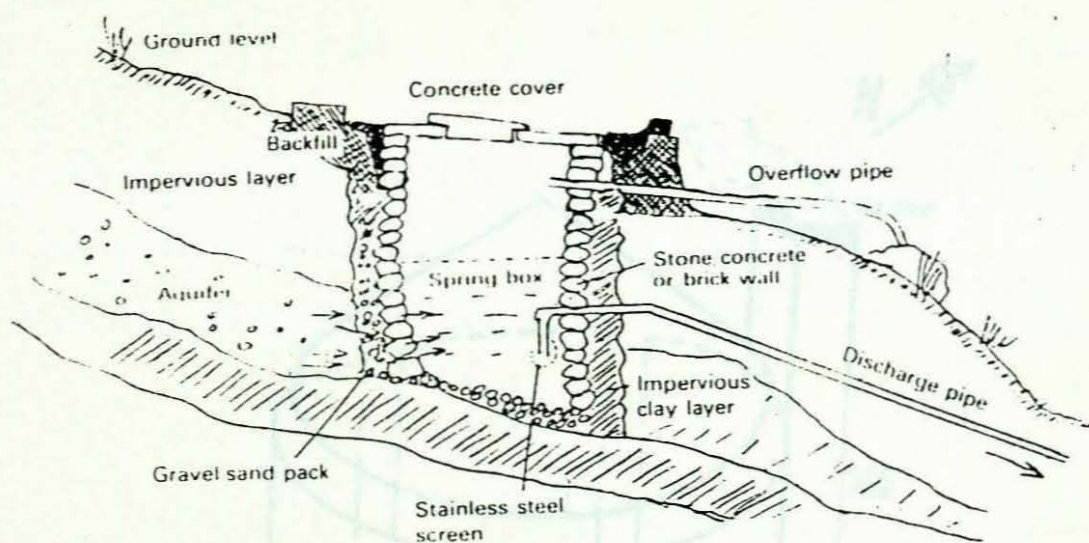
An example of a spring water storage chamber or 'spring box'.



Once the stone wall or brick wall or concrete rings have been laid in position and surrounded by the necessary gravel pack, which usually consists of coarse river sand or gravel, a concrete lid is prepared for fitting on the top of the 'spring box'. Normally steel piping is used to convey water through the wall of the 'box', and heavy duty polypipe or PVC from the 'box' to the water point.

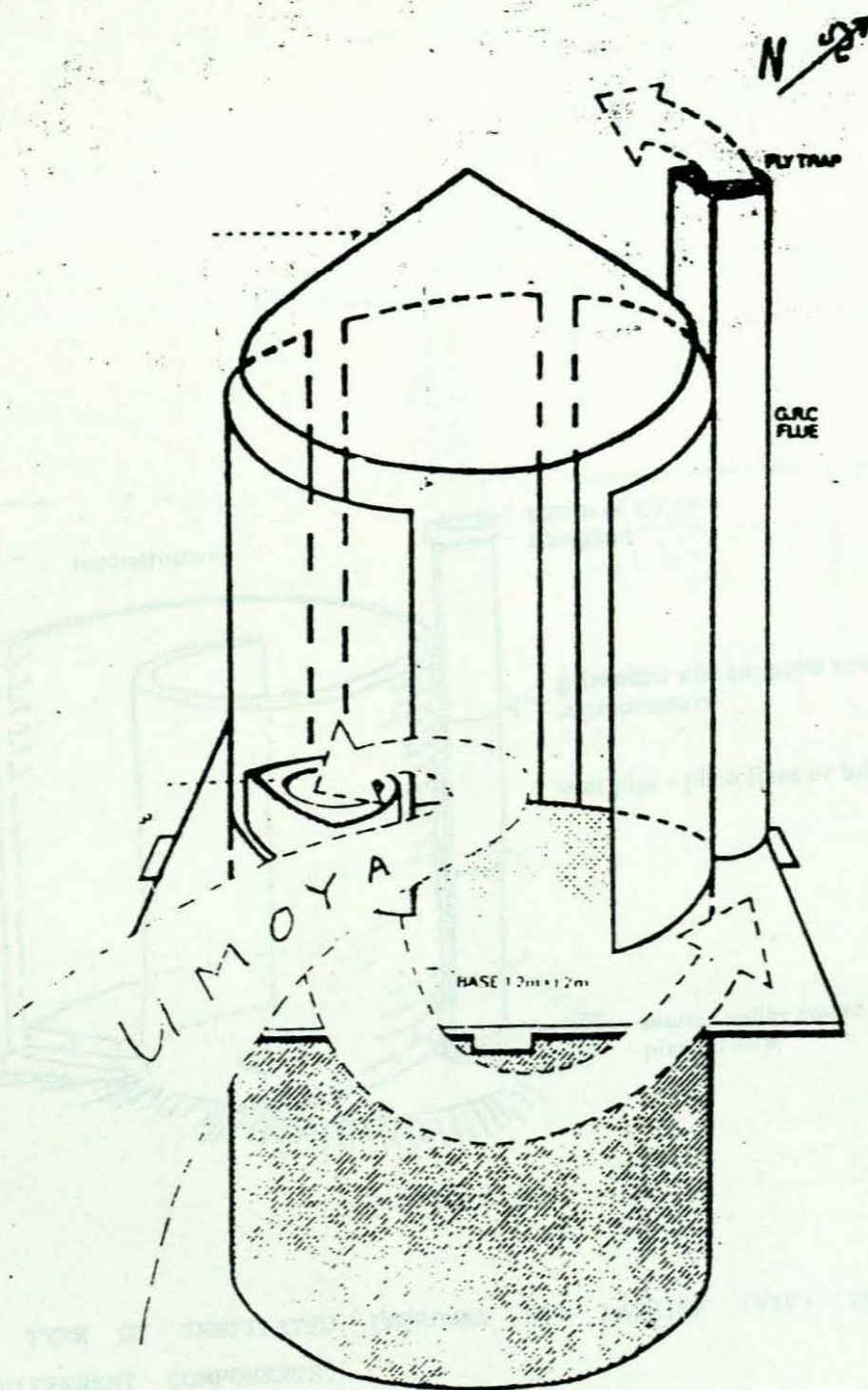
SOURCE:- MORGAN, P. (1990: 215)





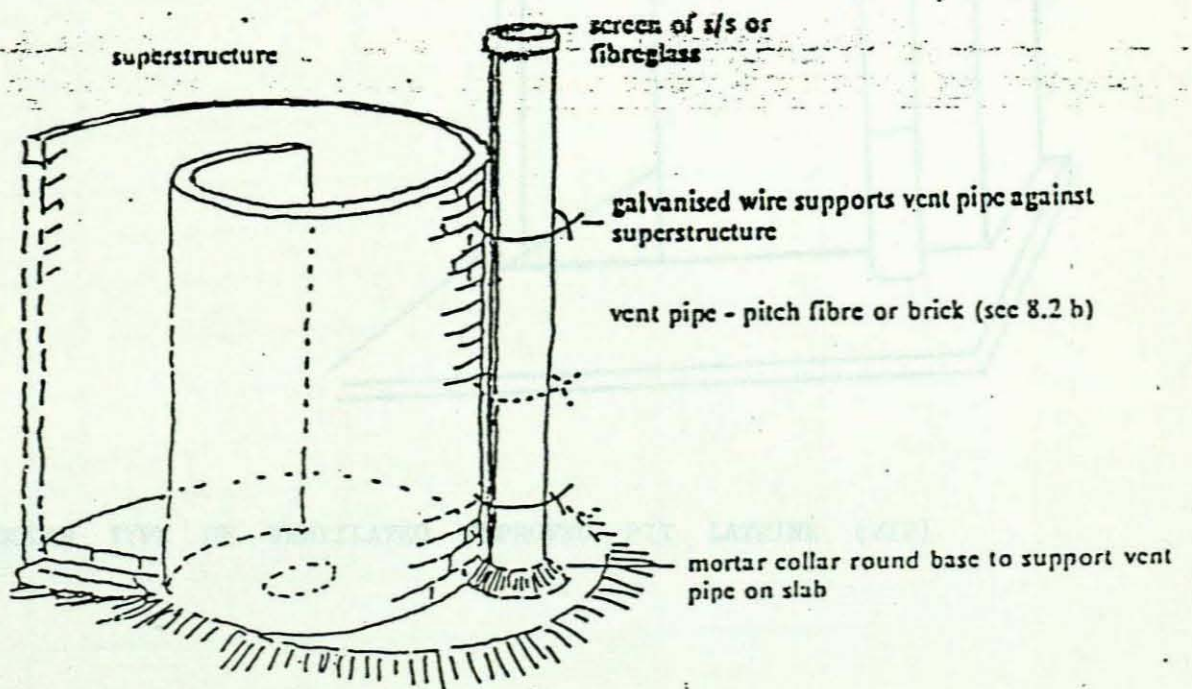
Protected artesian spring — infiltration from base of reservoir.

SOURCE:- MORGAN, P. (1990: 216)

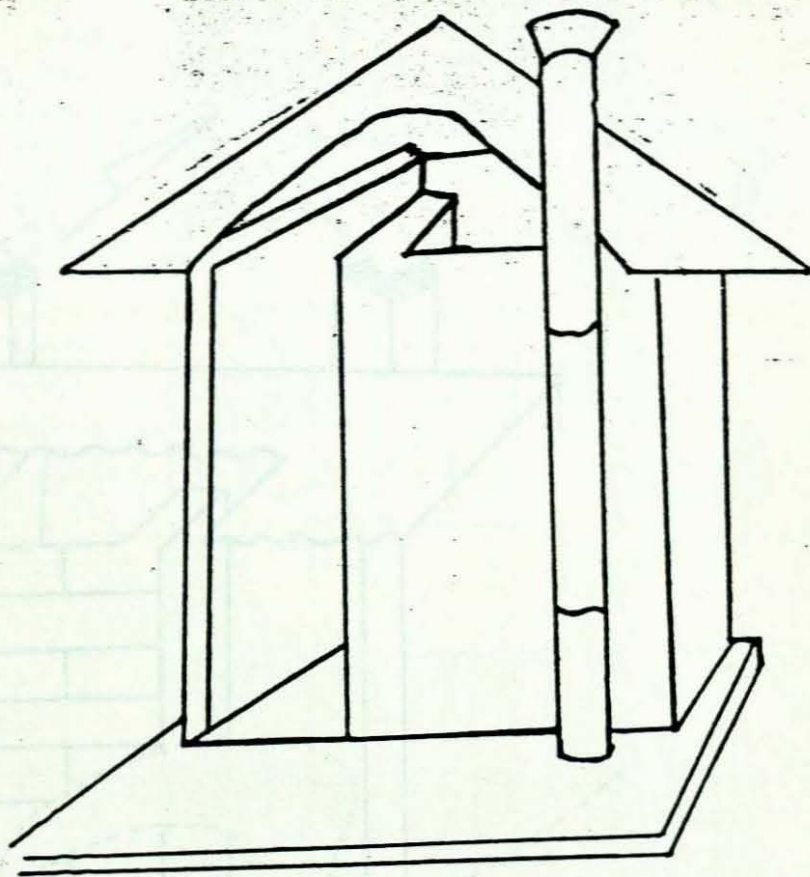


SPIRAL TYPE OF VENTILATED IMPROVED PIT LATRINE (VIP) INDICATING  
INCOMING AND OUTGOING DRAUGHT THUS RENDERING THE TOILET ODOURLESS.



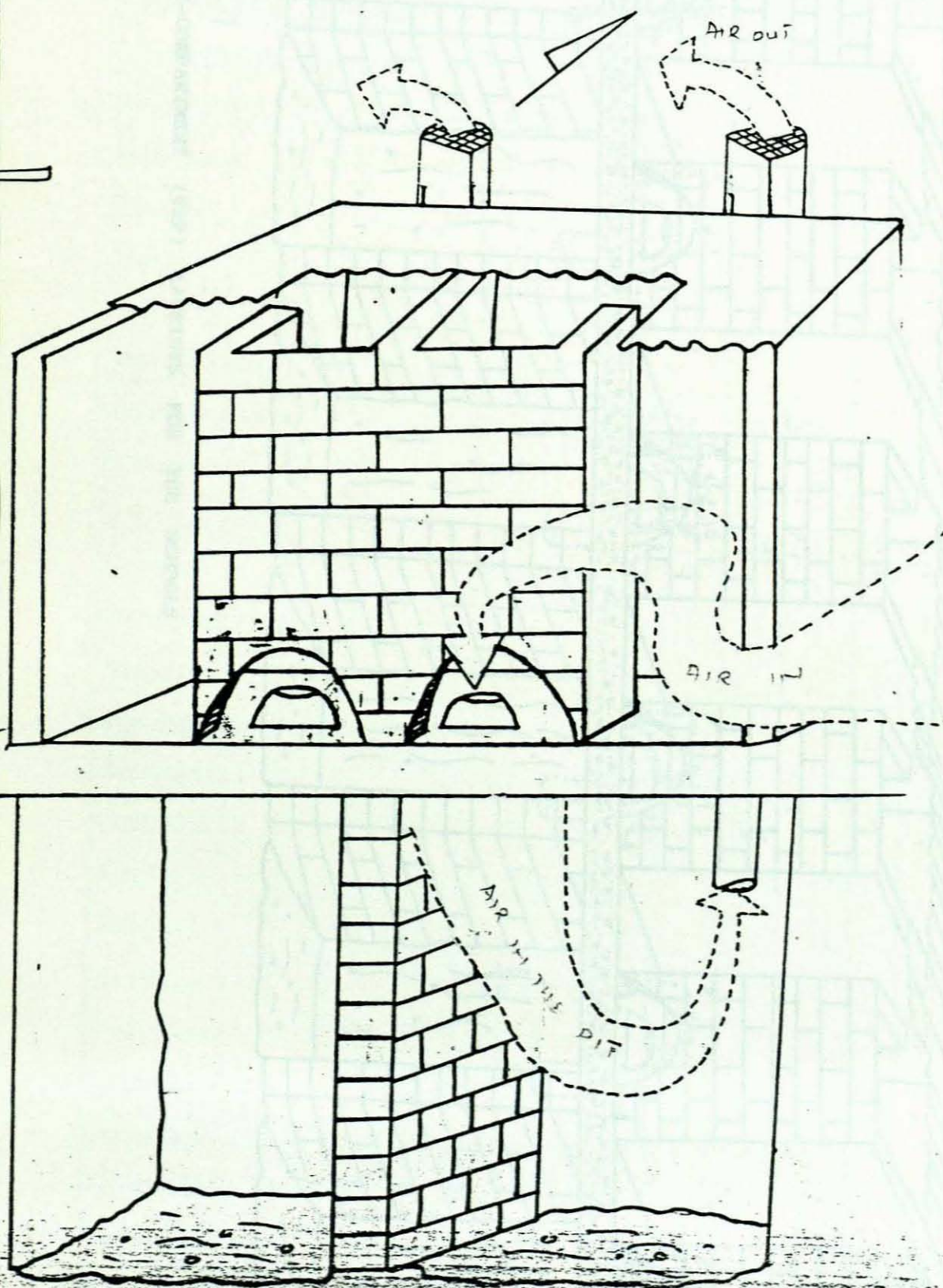


SPIRAL TYPE OF VENTILATED IMPROVED PIT LATRINE (VIP) INDICATING IT'S DIFFERENT COMPONENTS.



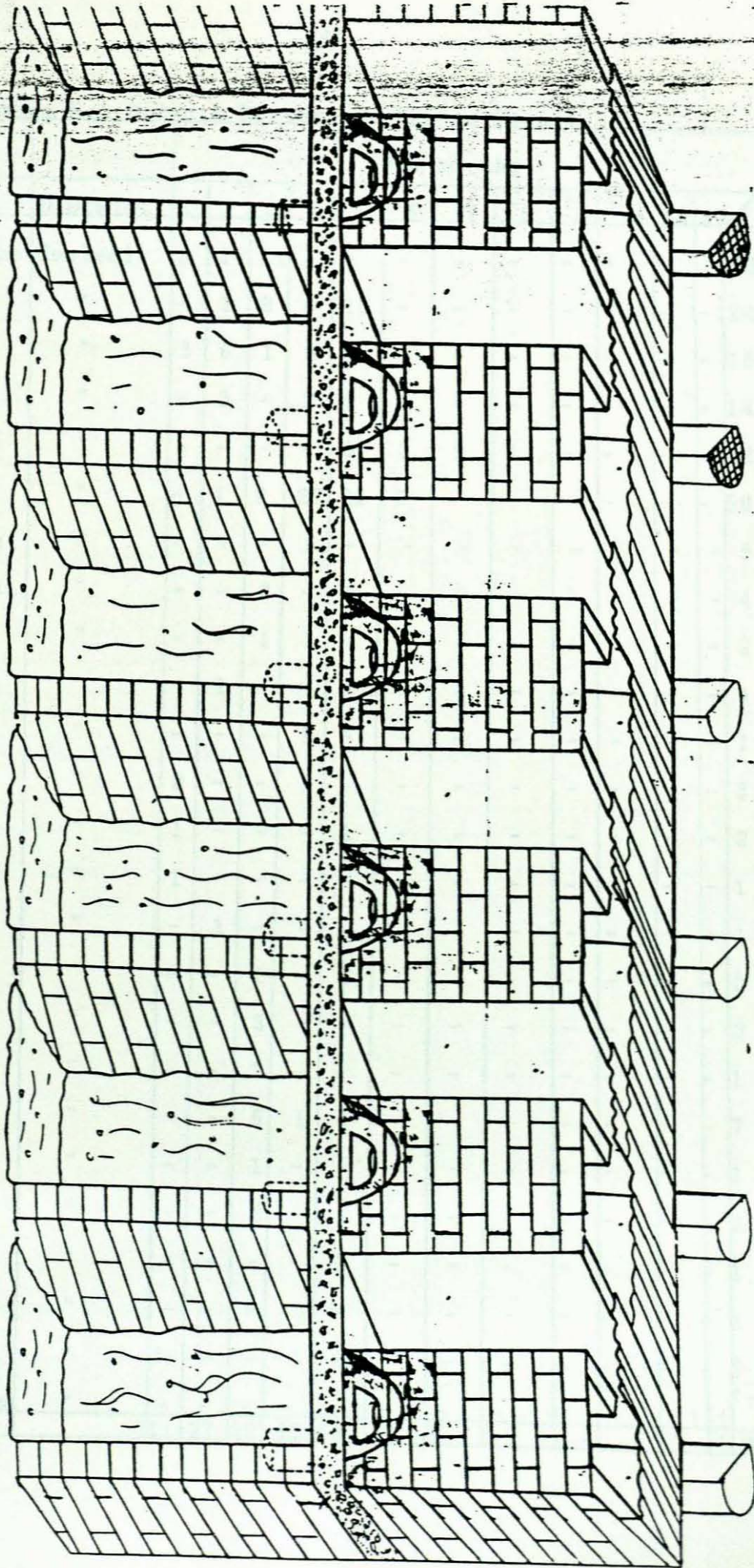
RECTANGULAR TYPE OF VENTILATED IMPROVED PIT LATRINE (VIP)





DOUBLE RECTANGULAR (VIP) LATRINE INDICATING INCOMING AND OUTGOING DRAUGHT  
THUS RENDERING THE TOILET ODOURLESS.





MULTI-COMPARTMENT (VIP) LATRINES FOR THE SCHOOLS



Annexure H.1 Malaria Pattern in Ongove Region

| Place        | District | 1989 months |    |    |    |    |    |   |   |   |    |    |     |
|--------------|----------|-------------|----|----|----|----|----|---|---|---|----|----|-----|
|              |          | 1           | 2  | 3  | 4  | 5  | 6  | 7 | 8 | 9 | 10 | 11 | 12  |
| Mevamhlophe  | Nseleni  | 3           | 14 | 11 | 4  | -  | -  | - | - | - | -  | -  | 32  |
| Dondotha     | "        | -           | 1  | 9  | 4  | 10 | -  | - | - | - | -  | -  | 24  |
| Macekane     | "        | 3           | 6  | 1  | 5  | -  | -  | - | - | - | -  | -  | 15  |
| Embabe       | "        | -           | 3  | -  | 2  | 9  | -  | - | - | - | -  | -  | 14  |
| Cwaka        | "        | -           | -  | -  | -  | 8  | 2  | 1 | 1 | - | -  | -  | 12  |
| Sabhuza      | "        | -           | 1  | 2  | 27 | 21 | 5  | - | - | - | -  | -  | 56  |
| Ntambanana   | "        | -           | -  | -  | 5  | -  | -  | - | - | - | -  | -  | 5   |
| Enhlabosini  | "        | -           | -  | 2  | -  | 2  | -  | - | - | - | -  | -  | 4   |
| Mabhuyeni    | "        | -           | -  | 1  | 1  | -  | -  | - | - | - | -  | -  | 2   |
| Ndabayakhe   | "        | -           | 1  | -  | -  | -  | 3  | - | - | - | -  | -  | 4   |
| Ntobozi      | "        | -           | -  | -  | 1  | -  | -  | - | - | - | -  | -  | 1   |
| Matshane     | "        | 2           | -  | -  | 1  | -  | -  | - | - | - | -  | -  | 3   |
| Ntoiyeni     | "        | 1           | -  | -  | -  | 1  | -  | - | - | - | -  | -  | 2   |
| Gqabhiyane   | "        | 1           | -  | -  | -  | -  | -  | - | - | - | -  | -  | 1   |
| Entweni      | "        | -           | 1  | -  | -  | -  | -  | - | - | - | -  | -  | 1   |
| Ovondlo      | "        | -           | -  | 1  | -  | 2  | -  | - | - | - | -  | -  | 3   |
| Kwadlamu     | "        | -           | -  | 3  | -  | -  | -  | - | - | - | -  | -  | 3   |
| Efuyeni      | "        | -           | -  | 1  | -  | -  | -  | - | - | - | -  | -  | 1   |
| Matholeni    | "        | -           | -  | 5  | 1  | 1  | -  | - | - | - | -  | -  | 7   |
| Ekulimeni    | "        | -           | -  | 1  | -  | -  | -  | - | - | - | -  | -  | 1   |
| Sokhulu      | "        | -           | -  | 2  | -  | 1  | -  | - | - | - | -  | -  | 3   |
| Ntombane     | "        | -           | -  | -  | -  | 1  | -  | - | - | - | -  | -  | 1   |
| Nhlanzini    | "        | -           | -  | -  | 1  | -  | -  | - | - | - | -  | -  | 1   |
| Empangeni    | "        | -           | -  | -  | 1  | -  | -  | - | - | - | -  | -  | 1   |
| Matshamnyama | "        | -           | -  | -  | -  | -  | -  | - | - | - | -  | -  | 1   |
| TOTAL        |          | 11          | 27 | 39 | 53 | 56 | 10 | 1 | 1 | - | -  | -  | 199 |



| Place         | District  | 1  | 2  | 3  | 4  | 5  | 6  | 7 | 8 | 9 | 10 | 11 | 12 |     |
|---------------|-----------|----|----|----|----|----|----|---|---|---|----|----|----|-----|
| Esikhawini    | Ongoye    | 3  | -  | -  | 1  | -  | -  | - | 5 | - | -  | 1  | 4  | 14  |
| Dlangezwa     | "         | 1  | -  | -  | -  | 1  | 1  | - | - | - | -  | -  | -  | 3   |
| TOTAL         |           | 4  | -  | -  | 1  | 1  | 1  | - | 5 | - | -  | 1  | 4  | 17  |
| Ndlangubo     | Inkanyezi | -  | -  | -  | -  | -  | -  | 4 | - | - | -  | -  | -  | 4   |
| Mombeni       | "         | -  | 1  | 4  | -  | -  | -  | - | - | - | -  | -  | -  | 5   |
| Kuphumuleni   | "         | -  | -  | 1  | -  | -  | -  | - | - | - | -  | -  | -  | 1   |
| Maphumulo     | "         | -  | -  | -  | 1  | -  | -  | - | - | - | -  | -  | -  | 1   |
| Maqhwakazi    | "         | -  | -  | -  | -  | 1  | -  | - | - | - | -  | -  | -  | 1   |
| TOTAL         |           | -  | 1  | 5  | 1  | 1  | -  | 4 | - | - | -  | -  | -  | 12  |
| TOTAL Nkandla |           | -  | -  | -  | -  | -  | -  | - | - | - | -  | -  | -  | -   |
| GRAND TOTAL   |           | 15 | 28 | 44 | 55 | 58 | 11 | 5 | 6 | - | -  | 1  | 5  | 228 |

## Annexure H.2 Malaria Pattern in Ongoye Region

| Place       | District | 1990 Months |   |   |    |    |   |   |   |   |    |    |    |
|-------------|----------|-------------|---|---|----|----|---|---|---|---|----|----|----|
|             |          | 1           | 2 | 3 | 4  | 5  | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mevamhlophe | Nseleni  | -           | 6 | 3 | 1  | -  | - | - | - | - | -  | -  | 10 |
| Dondotha    | "        | 1           | - | 2 | -  | 4  | - | - | - | - | -  | -  | 7  |
| Macekane    | "        | -           | 1 | - | 1  | -  | - | - | - | - | -  | -  | 2  |
| Mbabe       | "        | -           | - | - | 2  | 1  | - | - | - | - | -  | -  | 3  |
| Cwaka       | "        | -           | - | - | -  | 2  | 1 | - | - | - | -  | -  | 3  |
| Sabhuza     | "        | -           | - | - | 7  | 5  | - | - | - | - | -  | -  | 12 |
| Mabhuyeni   | "        | -           | - | 1 | -  | -  | - | - | - | - | -  | -  | 1  |
| Ovondlo     | "        | -           | - | - | -  | 1  | - | - | - | - | -  | -  | 1  |
| Matholeni   | "        | -           | - | 1 | -  | -  | - | - | - | - | -  | -  | 1  |
| Sokhulu     | "        | -           | - | - | 1  | -  | - | - | - | - | -  | -  | 1  |
| TOTAL       |          | 1           | 7 | 7 | 12 | 13 | 1 | - | - | - | -  | -  | 41 |



|                    |   |    |    |    |    |   |   |   |   |   |   |    |
|--------------------|---|----|----|----|----|---|---|---|---|---|---|----|
| Esikhawini Ongoye  | - | 5  | 7  | 7  | 1  | 6 | - | 2 | - | - | - | 28 |
| Dlangezwa "        | - | -  | 1  | 3  | -  | - | - | - | - | - | - | 4  |
| Amatikulu "        | - | 2  | 1  | 1  | -  | - | - | - | - | - | - | 4  |
| Esikhawini T/S "   | - | -  | -  | -  | 1  | - | - | - | - | - | - | 1  |
| Dokodweni "        | - | 1  | -  | -  | -  | - | - | - | - | - | - | 1  |
| TOTAL              | - | 8  | 9  | 11 | 2  | 6 | - | 2 | - | - | - | 38 |
| Dlangubo Inkanyezi | - | 1  | 2  | 3  | -  | - | - | - | - | - | - | 6  |
| Mombeni "          | - | -  | -  | -  | -  | - | 1 | - | - | - | - | 1  |
| Maqhvakazi "       | - | -  | -  | -  | 1  | - | - | - | - | - | - | 1  |
| TOTAL              | - | 1  | 2  | 3  | 1  | - | 1 | - | - | - | - | 8  |
| Mhlathuze Nkandla  | - | 1  | -  | -  | -  | - | - | - | - | - | - | 1  |
| TOTAL              | - | 1  | -  | -  | -  | - | - | - | - | - | - | 1  |
| GRAND TOTAL        | 1 | 17 | 18 | 26 | 16 | 7 | 1 | 2 | - | - | - | 88 |

## Annexure H.3 Typhoid Pattern in Ongoye Region

| Place          | District | 1989 Months |   |   |   |   |   |   |   |   |    |    |    |
|----------------|----------|-------------|---|---|---|---|---|---|---|---|----|----|----|
|                |          | 1           | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
| Mfanefile      | Nseleni  | 1           | - | - | - | - | - | - | - | - | -  | -  | 1  |
| Kuthuleni      | "        | 1           | - | - | - | - | - | - | - | - | -  | -  | 1  |
| Makhasane      | "        | 1           | - | - | - | - | - | - | - | - | -  | -  | 1  |
| Matikwe        | "        | 1           | - | - | - | - | - | - | - | - | -  | -  | 1  |
| Macekane       | "        | 1           | - | - | - | - | - | - | - | - | -  | -  | 1  |
| Mbabe          | "        | -           | - | 1 | - | - | - | - | - | - | -  | -  | 1  |
| Sokhulu        | "        | -           | - | 1 | - | - | - | - | - | - | -  | -  | 1  |
| Ngwelezane T/S | "        | -           | - | 1 | - | - | - | - | - | - | -  | -  | 1  |
| Vondlo         | "        | -           | - | 1 | - | - | - | - | - | - | -  | -  | 1  |
| Dondotha       | "        | -           | - | - | 2 | - | - | - | - | - | -  | -  | 2  |
| Bhiliya        | "        | -           | - | - | 1 | - | - | - | - | - | -  | -  | 1  |
| Mawanda        | "        | -           | - | - | 1 | - | - | - | - | - | -  | -  | 1  |

|                    |   |   |   |   |   |   |   |   |   |   |   |   |   |    |
|--------------------|---|---|---|---|---|---|---|---|---|---|---|---|---|----|
| Nteweni            | " | - | - | - | - | - | 1 | - | - | - | - | - | - | 1  |
| Mpumelilweni       | " | - | - | - | - | - | 1 | - | - | - | - | - | - | 1  |
| Shayamoya          | " | - | - | - | - | - | 1 | - | - | - | - | - | - | 1  |
| Mshwaneni          | " | - | - | - | - | - | - | 1 | - | - | - | - | - | 1  |
| Ndondwane          | " | - | - | - | - | - | - | - | - | - | - | - | 1 | 1  |
| Mabhuyeni          | " | - | - | - | - | - | - | - | - | - | - | - | 2 | 2  |
| <b>TOTAL</b>       |   | 5 | - | 4 | 4 | - | 3 | 1 | - | - | - | - | 3 | 20 |
| Kuphumuleni Ongoye |   | 2 | - | - | - | - | - | - | - | - | - | - | - | 2  |
| Nsiwa              | " | - | - | 1 | - | - | - | - | - | - | - | - | - | 1  |
| Gingindlovu        | " | - | - | 1 | - | - | - | - | - | - | - | - | - | 1  |
| Mankaza            | " | - | - | - | 1 | - | - | - | - | - | - | - | - | 1  |
| Makholokotho       | " | - | - | - | 1 | - | - | - | - | - | - | - | - | 1  |
| Nteneshane         | " | - | - | - | - | 1 | - | - | - | - | - | - | - | 1  |
| Phindweni          | " | - | - | - | - | 1 | - | - | - | - | - | - | - | 1  |
| Manzamnyama        | " | - | - | - | - | - | 1 | - | - | - | - | - | - | 1  |
| Lambothe           | " | - | - | - | - | - | 1 | - | - | - | - | - | - | 1  |
| Banjeni            | " | - | - | - | - | - | - | 1 | - | - | - | - | - | 1  |
| Mvutshini          | " | - | - | - | - | - | - | - | - | 2 | - | - | - | 2  |
| Sikhawini          | " | - | - | - | - | - | - | - | - | - | - | - | 1 | 1  |
| <b>TOTAL</b>       |   | 2 | - | 2 | 2 | 2 | 2 | 1 | - | 2 | - | - | 1 | 14 |
| Vutha Nkanyezi     |   | 1 | - | - | - | - | 1 | - | - | - | - | - | - | 1  |
| Vuma               | " | 1 | - | - | - | - | - | - | - | - | - | - | - | 1  |
| Mfana              | " | - | - | - | 1 | - | - | - | - | - | - | - | - | 1  |
| Mombeni            | " | - | - | - | 1 | - | - | - | - | - | - | - | - | 1  |
| Mkhukhuze          | " | - | - | - | 1 | - | - | - | - | - | - | - | - | 1  |
| Matigulu           | " | - | - | - | - | 1 | - | - | - | - | - | - | - | 1  |
| Ntumeni            | " | - | - | - | - | 1 | - | - | - | - | - | - | - | 1  |
| Nogobhoza          | " | - | - | - | - | 1 | - | - | - | - | - | - | - | 1  |



|                |         |   |   |   |   |    |   |   |   |   |   |   |   |    |
|----------------|---------|---|---|---|---|----|---|---|---|---|---|---|---|----|
| Mandeni        | "       | - | - | - | - | -  | 1 | - | - | - | - | - | - | 1  |
| Mfihlo         | "       | - | - | - | - | -  | - | 1 | - | - | - | - | - | 1  |
| Mpofu          | "       | - | - | - | - | -  | - | - | - | - | 1 | - | - | 1  |
| Hlungwini      | "       | - | - | - | - | -  | - | - | - | - | 1 | - | - | 1  |
| Ntenjane       | "       | - | - | - | - | -  | - | - | - | - | 1 | - | - | 1  |
| Dukaneni       | "       | - | - | - | - | -  | - | - | - | - | - | 1 | - | 1  |
| Dendethu       | "       | - | - | - | - | -  | - | - | - | - | - | 1 | - | 1  |
| Sundumbili     | "       | - | - | - | - | -  | - | - | - | - | - | - | 1 | 1  |
| Ngogo          | "       | - | - | - | - | -  | - | - | - | - | - | - | 1 | 1  |
| TOTAL          |         | 2 | - | - | 3 | 3  | 2 | 1 | - | - | 4 | 2 | 2 | 19 |
| Mhlathuze      | Nkandla | - | 1 | - | - | -  | - | - | - | - | - | - | - | 1  |
| Chwezi         | "       | - | - | - | - | 1  | - | - | - | - | - | - | - | 1  |
| Ohlelo         | "       | - | - | - | - | 1  | - | - | - | - | - | - | - | 1  |
| Zibhembeni     | "       | - | - | - | - | 2  | - | - | - | - | - | - | - | 2  |
| Ngwegweni      | "       | - | - | - | - | 1  | - | - | - | - | - | - | - | 1  |
| Vumanhlamvu    | "       | - | - | - | - | 1  | - | - | - | - | - | - | - | 1  |
| Sizanani Store | "       | - | - | - | - | -  | 1 | - | - | - | - | - | - | 1  |
| Ntingwe        | "       | - | - | - | - | -  | - | - | - | 1 | - | - | - | 1  |
| TOTAL          |         | - | 1 | - | - | 6  | 1 | - | - | 1 | - | - | - | 9  |
| GRAND TOTAL    |         | 9 | 1 | 6 | 9 | 11 | 8 | 3 | - | 3 | 4 | 2 | 6 | 62 |

## Annexure H.4 Typhoid Pattern in Ongoye Region

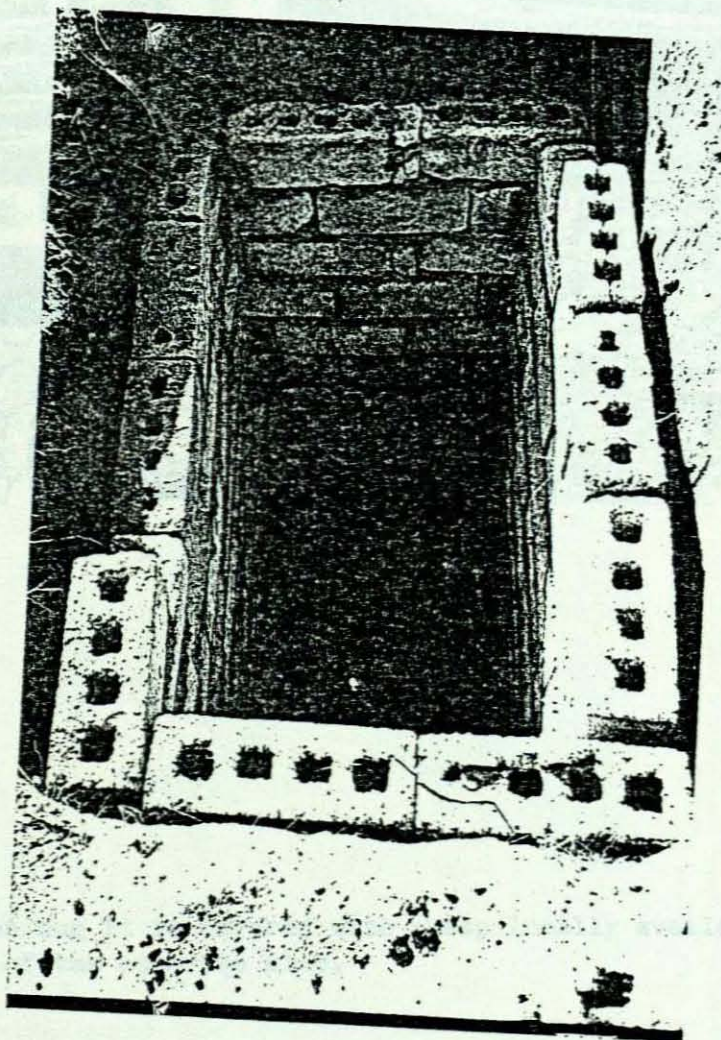
| Place        | District | 1990 Months |          |          |          |          |          |          |          |          |          |          |           |
|--------------|----------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|----------|-----------|
|              |          | 1           | 2        | 3        | 4        | 5        | 6        | 7        | 8        | 9        | 10       | 11       | 12        |
| Mkhandlwini  | Nseleni  | 1           | -        | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Mbabe        | "        | -           | 1        | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Mabhuyeni    | "        | -           | 1        | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Ndundulu     | "        | -           | 1        | -        | -        | -        | -        | -        | -        | -        | 1        | -        | 2         |
| Bedlana      | "        | -           | -        | -        | 1        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Matshana     | "        | -           | -        | -        | -        | 1        | -        | -        | -        | -        | -        | -        | 1         |
| Ndabayakhe   | "        | -           | -        | -        | -        | 1        | -        | -        | -        | -        | -        | -        | 1         |
| Makhosini    | "        | -           | -        | -        | -        | -        | 3        | -        | 1        | 1        | -        | -        | 5         |
| Nkwalini     | "        | -           | -        | -        | -        | -        | -        | 1        | -        | 1        | -        | -        | 2         |
| Kuthuleni    | "        | -           | -        | -        | -        | -        | -        | -        | 2        | -        | -        | -        | 2         |
| Nomponjwana  | "        | -           | -        | -        | -        | -        | -        | -        | 1        | -        | -        | -        | 1         |
| Mfanefile    | "        | -           | -        | -        | -        | -        | -        | -        | -        | 1        | -        | -        | 1         |
| Matshitshilo | "        | -           | -        | -        | -        | -        | -        | -        | -        | 1        | -        | -        | 1         |
| <b>TOTAL</b> |          | <b>1</b>    | <b>1</b> | <b>2</b> | <b>1</b> | <b>2</b> | <b>3</b> | <b>1</b> | <b>4</b> | <b>4</b> | <b>-</b> | <b>1</b> | <b>20</b> |
| Mpembeni     | Ongoye   | -           | 1        | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Dlangezwa    | "        | -           | -        | 1        | -        | 1        | -        | -        | -        | -        | -        | -        | 2         |
| Nyathini     | "        | -           | -        | 1        | -        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Phindweni    | "        | -           | -        | 1        | -        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Wangu        | "        | -           | -        | -        | 1        | -        | -        | -        | -        | -        | -        | -        | 1         |
| Sinyabusi    | "        | -           | -        | -        | -        | -        | -        | -        | 1        | -        | -        | -        | 1         |
| Dokodweni    | "        | -           | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1        | 1         |
| Mnengwa      | "        | -           | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1        | 1         |
| Mvutshini    | "        | -           | -        | -        | -        | -        | -        | -        | -        | -        | -        | -        | 1         |
| <b>TOTAL</b> |          | <b>-</b>    | <b>1</b> | <b>3</b> | <b>1</b> | <b>1</b> | <b>-</b> | <b>-</b> | <b>1</b> | <b>-</b> | <b>-</b> | <b>2</b> | <b>10</b> |





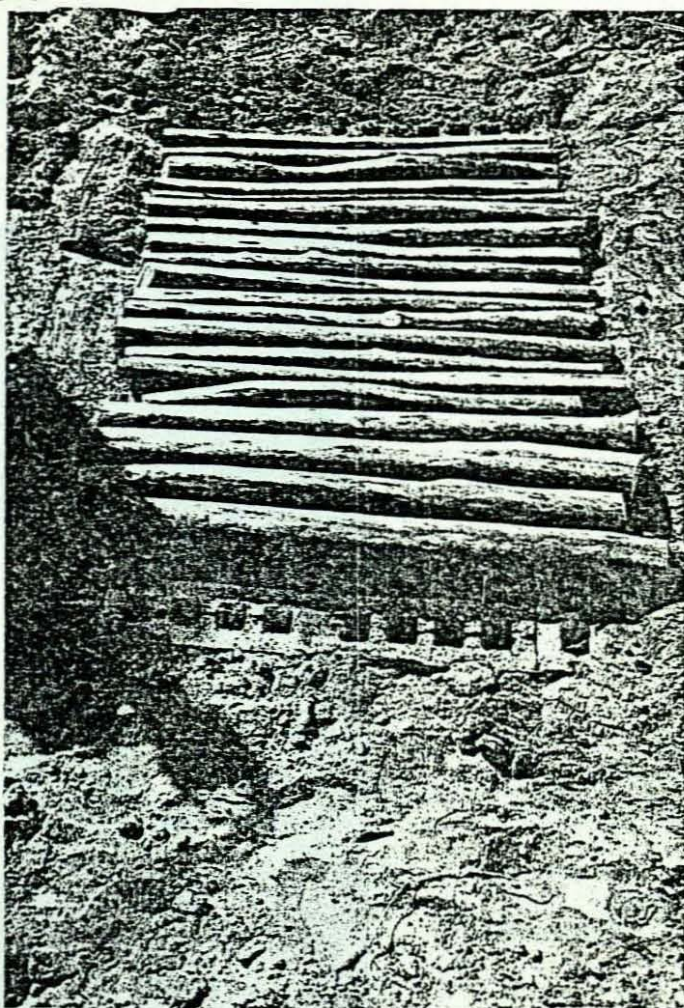
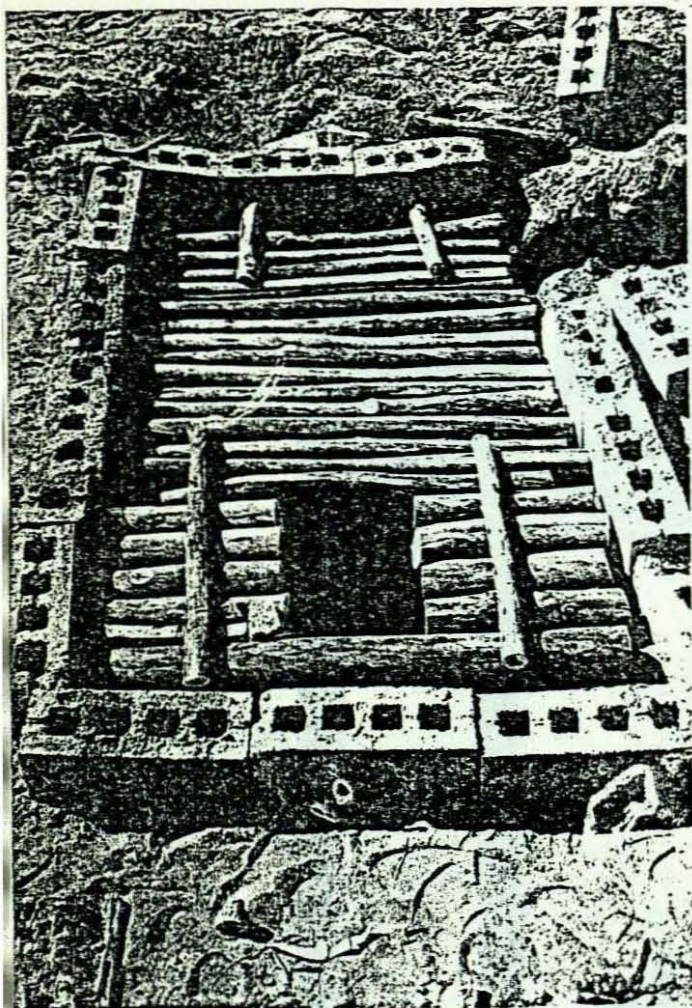
|             |         |   |   |    |   |   |   |   |   |   |   |   |   |    |
|-------------|---------|---|---|----|---|---|---|---|---|---|---|---|---|----|
| Dikinyane   | "       | - | - | -  | - | - | - | - | - | - | - | - | 1 | 1  |
| Nyoni       | "       | - | - | -  | - | - | - | - | - | - | - | - | 1 | 1  |
| TOTAL       |         | 5 | - | 11 | 5 | 1 | 1 | 1 | 2 | 4 | 8 | 4 | 4 | 46 |
| Ngweni      | Nkandla | 1 | - | -  | - | - | - | - | - | - | - | - | - | -  |
| Thaleni     | "       | - | 1 | -  | - | 1 | - | - | - | - | - | - | - | 2  |
| Ntingwe     | "       | - | - | -  | - | - | - | - | - | 1 | - | - | - | 1  |
| TOTAL       |         | 1 | 1 | -  | - | 1 | - | - | - | 1 | - | - | - | 4  |
| GRAND TOTAL |         | 7 | 3 | 16 | 7 | 5 | 4 | 2 | 7 | 9 | 8 | 7 | 5 | 80 |



PHOTOGRAPH 1VIP LATRINE PIT

This is the lining of the pit for the construction of a VIP latrine. This lining is very important in the sandy areas to prevent the collapse of the pit walls.



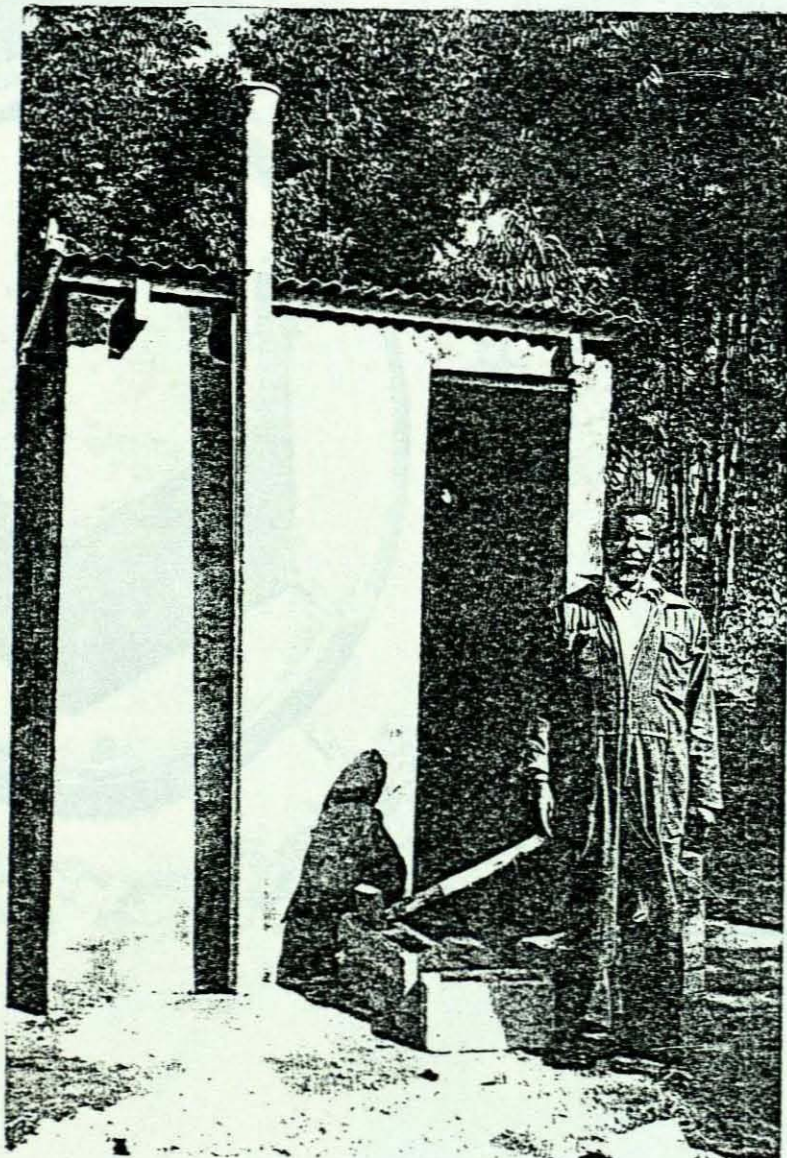
VIP LATRINE SLAB

After the pit has been dug it is covered with cheap locally available material to reinforce casting of the concrete slab.

This is a complete rectangular VIP latrine above superstructure in form of concrete blocks and mortar.



COMPLETED VIP LATRINE

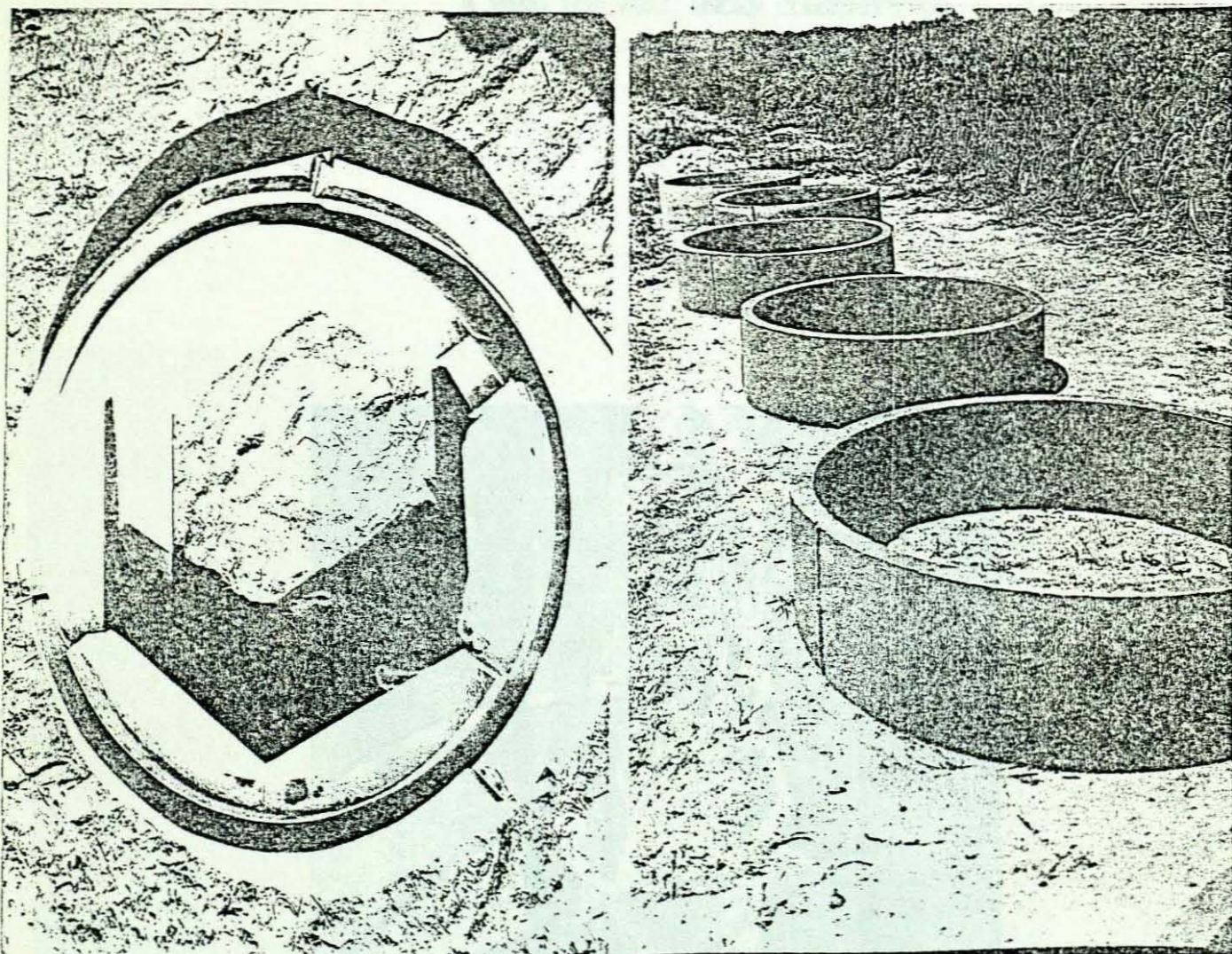


This is a complete rectangular VIP latrine whose superstructure is made of cement blocks and mortar.



## PHOTOGRAPH 4

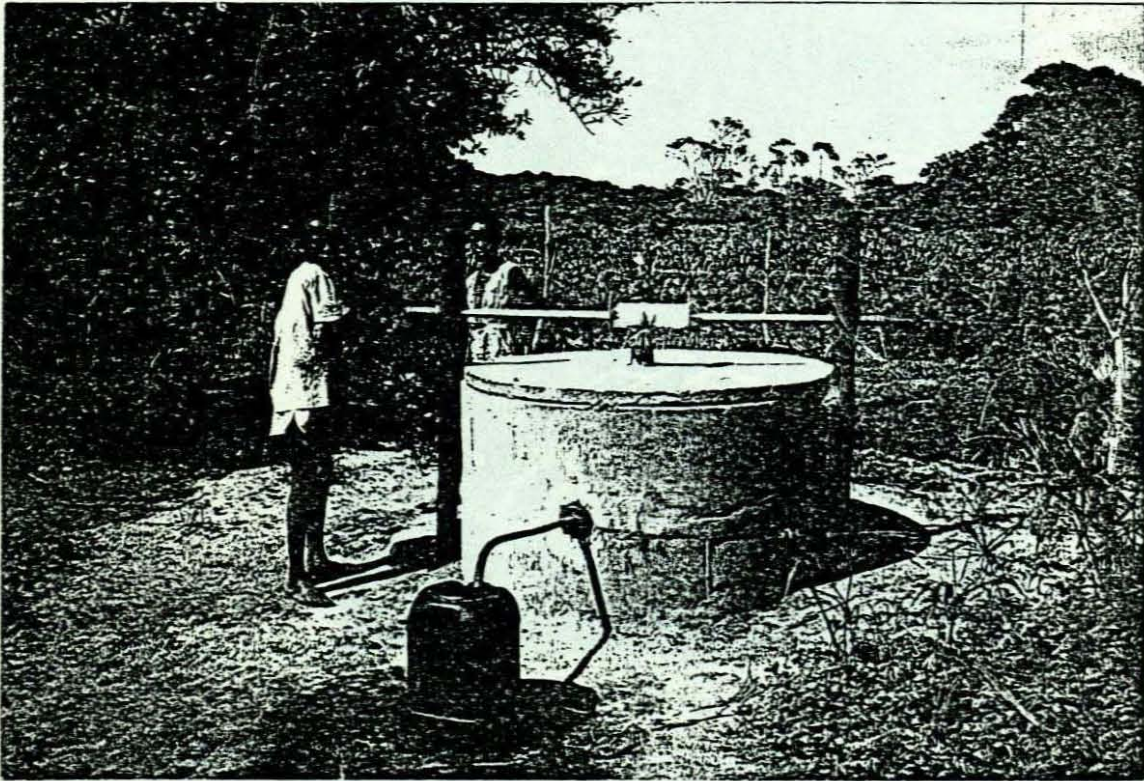
## A SET OF MOULDS AND COMPLETED RINGS



A set of moulds for making cement rings. These rings are used in the construction of hand-dug wells on the sandy areas.

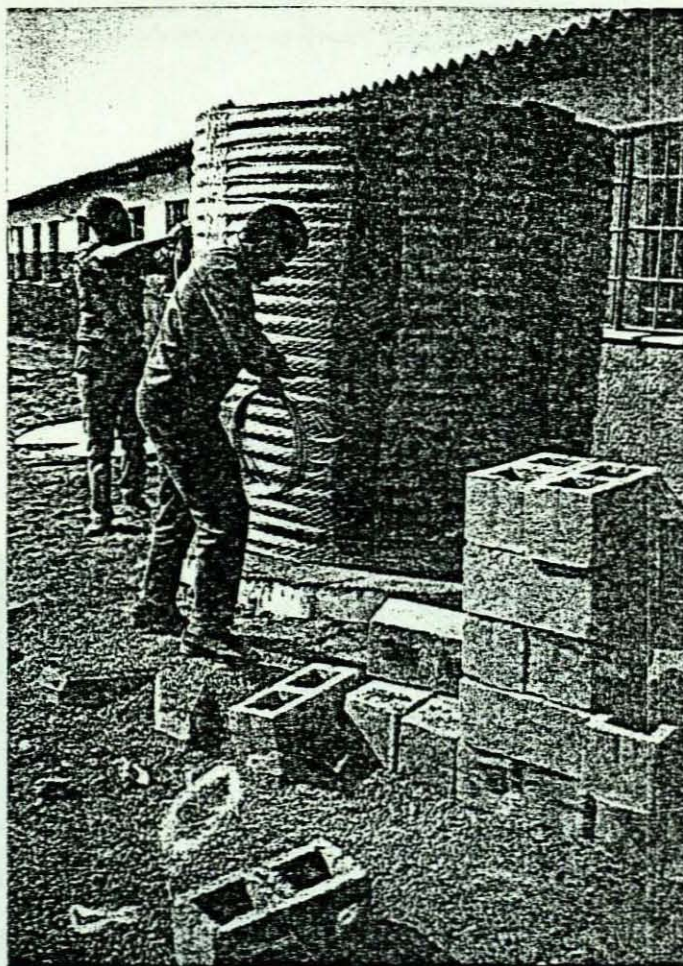
The cement rings are pushed down through the sand with the help of the wooden table.



A COMPLETED HAND DUG WELL

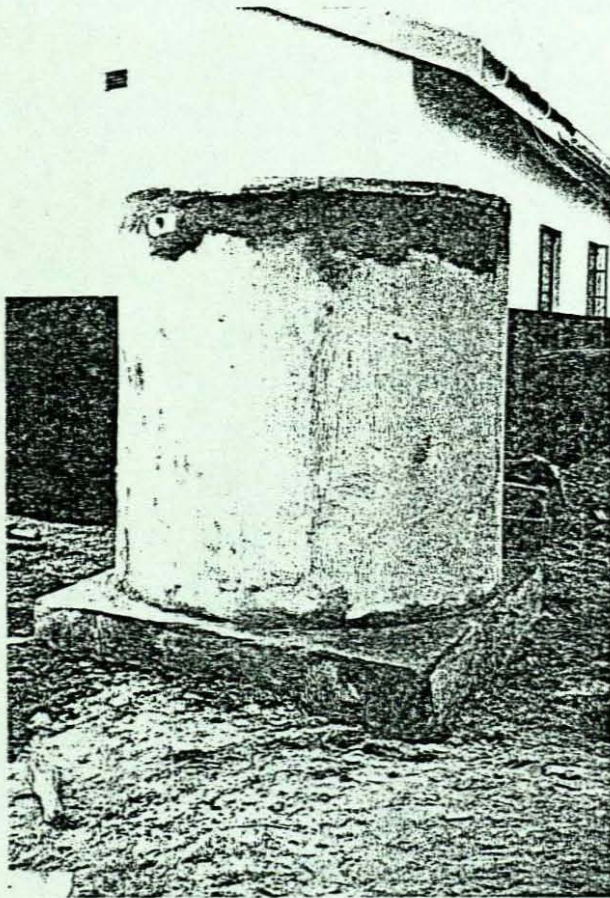
After the rings have reached the water table they are covered on top to prevent contamination. This is therefore the completed hand-dug well.



FERRO CEMENT TANK MOULD

This is a set of moulds for making ferro-cement tanks.



ANNEXURE 1.8PHOTOGRAPH 8A COMPLETED FERRO CEMENT TANK

This is a completed ferro-cement tank made out of a set of moulds.