CHAPTER 9
CONCLUSIONS

It was stated in the Introduction that the Study formed part of the Savanna Ecosystem Project. The aims of this Study were threefold:

to determine species diversity and distribution of reptiles and amphibians in the Nylsvley Nature Reserve;

to determine the population size and biomass of reptiles and amphibians in the Ecosystem Study Area;

to determine the inter-relationships between the reptiles and amphibians and their physical and biotic environment.

Discussions pertaining to these aspects were made in previous Chapters and, therefore, this Chapter will deal solely with conclusions derived from the results of this Study.

Species diversity and distribution of reptiles and amphibians on the Nylsvley Nature Reserve can be attributed to a combination of floristic and edaphic conditions, of which the former is also a function of the latter. Nevertheless, through structural and plant species diversity, reptile and amphibian habitat niche separation is enhanced. Differences in herpetofaunal diversity between the different vegetation types on the Nylsvley Nature Reserve are evident and is greatest in the *Burkea africana* - *Eragrostis pallens* Savanna.

However, when species diversity is compared to other Ecosystems, as discussed in Chapter 8, it is apparent that climatic factors must be taken into consideration and in fact form the basis for species diversity and distribution. The low rainfall, vegetation and edaphic structural conditions are responsible for the greater diversity of terrestrial lizards in the Nylsvley Nature Reserve in comparison to the other two areas discussed. Lizards appear to be more tolerant of environmental extremes and increase in diversity in arid environments, but temperature remains the controlling factor.

The Nylsvley Nature Reserve and the Study Area, although situated south of the tropics, have a diversity more commensurate with more tropical regions which may be explained by the habitat and structural diversity of the area which enhances diversity despite the limiting climatic factors.

Population density and biomass are low in comparison to other areas with the exception of the amphibians where it is higher, which factor can be attributed both to the climate with dry and cold winters, as well as the sandy nature of the soil and its higher elevation as mass migration into the Study Area takes place annually.

All three populations, i.e. snakes, lizards and amphibians display fluctuations in density and biomass, both monthly as well as annually. These fluctuations are attributable to differences in rainfall and temperature, which affect reproductive success, food availability and movement, which in turn affect reproductive potential and survival. The necessity of the amphibians to move out of the area to breed (with one exception) and to congregate around localized water bodies in large concentrations, must make them vulnerable to predation and this is confirmed by the low return of marked adult amphibians. The large influx of young toads must also sustain a high mortality, as many snakes feed on them, while hibernation during winter and dehydration during migration back into the Study Area must also be excessive. Biomass and density fluctuations are due to emigration, immigration, rainfall and drought.

Five orders of invertebrates form the main food of the lizards and amphibians. It is apparent that most reptiles and amphibians are opportunistic feeders, feeding on the most abundant and easily attainable invertebrates at any one time. Some degree of specialization has taken place, particularly on invertebrates such as the Hymenoptera (Formicidae) and Isoptera (Termitidae) because they are abundant yet relatively unexploited food sources. Therefore, there are several snake, lizard and amphibian species which are myrmecophagous. Most snakes are also opportunistic but a few are relatively stenophagous, such as the blind and thread snakes, centipede-eater and egg-eater.

The lizards, with the exception of the common chameleon, do not display unique anatomical adaptations for prey capture or storage. Amphibians on the other hand have the ability to distend their stomachs considerably and can, therefore, gorge themselves should the opportunity arise. This is a result of the variable and erratic precipitation and is therefore advantageous under these conditions.

It is, however, apparent that there is sufficient prey biomass to support the reptiles and amphibians and this therefore cannot be considered as a limiting factor influencing abundance and biomass.

The pronounced seasonality of the climate has induced various reproductive strategies to allow for climatic variations experienced in the Study Area.

Reptile reproductive activity starts mainly in Spring in accordance with a rise in temperature. Most eggs are laid during early to mid-summer and the young hatch during mid-to-late summer. This coincides with a peak in food availability and the juvenile reptiles and amphibians are able to hibernate in good condition. Hatchling egg-eaters emerge during September at a time when bird eggs are most prevalent.

Similarly, the amphibians are well adapted to the variable climate. As soon as heavy rain has fallen, they migrate to open water in which they breed. Although outside the Study Area, pools form an integral part of the amphibians' survival strategy. Hatching of eggs and larval development proceeds rapidly and juveniles re-enter the Study Area approximately 1-1,5 km distant at an approximate age of two months.

Large numbers of eggs are laid and the success of this strategy is evident in the large immigration of juveniles into the Study Area. Contrast this to the only amphibian breeding in the Study Area, the common short-head frog which only lays 10-20 eggs in a hole in the ground in which larval development and metamorphosis takes place. It is apparent that most of the water-dependent amphibians have based their reproductive strategy on a 'hit and miss basis; while the largely water-independent frog ensures survival by laying small clutches of large eggs, thereby expending less energy.

Growth in both reptiles and amphibians is initially fairly rapid, particularly in summer but because of low temperatures and resulting reduced metabolic activity during winter, a step-like growth pattern is evident.

There is a negative correlation between growth rate and S/V size. Two strategies are apparent, one, a population turnover on an annual basis and two, the long-lived species. Both appear to be equally successful. If the long-lived species do not reproduce during one year, it will not unduly affect the population, whereas the position of the annual reptiles is more critical. They overcome this by laying relatively large clutches of eggs and more than one clutch may be laid during a season, so that at least some members of one clutch are able to survive the variations in climate.

Only one species of reptile or amphibian on the Nylsvley Nature Reserve lays eggs throughout the year, namely Lygodactylus capensis. Clutch size is small but as the eggs are hard-shelled, they can withstand most climatic conditions and in fact a peak in egg-laying occurs during winter, indicating the success of their adaptation.

Movement, home ranges and territoriality are all governed by food availability, shelter and the chance to reproduce. Few species in the Study Area exhibit territoriality, some have home ranges. Overlap in home ranges between individuals of the same species as well as of different species indicate that these aspects are not limiting, although shelter may well be. Movements by snakes appear to be random and therefore possibly exploratory.

In conclusion it can be stated that the Ecosystem Study Area is unique in the diversity of its herpetofauna. This is due to increased structure of the habitat but is rigidly controlled by the seasonality of the climate; in particular temperature and rainfall against which the reptiles and amphibians have developed various strategies to ensure the survival of the species. These strategies are mainly apparent in their reproductive methods, as well as other aspects of their life style.

It is apparent from the relative densities and biomass of these animals in the Burkea africana Savanna that their impact as a whole on the Ecosystem is minimal, but they are still an integral part of the community and who knows what would happen should this group of lower vertebrates be removed from this system. They do form a link in the trophic chain and therefore in this respect may be important. They support a large number of predators, including birds, mammals, insects, reptiles and amphibians while they again prey on invertebrates and other vertebrates.

This process from climate to vegetation to invertebrates and so forth, up the trophic chain, to the decomposers, forms a continuous ring and should one of the links be removed, the system could collapse. The flow of energy will be interrupted and ultimately a more depauperate system will develop. This is the process of desertification.