# 1 What is Biodiversity?

## 1.1 Introduction

In recent years, considerable concern has been expressed about the global loss of biodiversity, due in large part to the accelerating destruction and conversion of tropical forests. Moist tropical forests cover approximately 7 % of the earth's land, yet they contain over one half of the world's species (Wilson 1988). As a result, primarily due to the loss of moist tropical forests, it is predicted that nearly one quarter of the earth's species could become extinct by the middle of this century.

The Eastern Arc Mountains (Fig. 1.1) contain most of the moist montane tropical forest in Tanzania and Kenya and are biologically the richest area for their size in East Africa. They also contain the highest proportion of endemic species of any region in East Africa. Unfortunately, human encroachment and over-exploitation severely threaten these forests. As a result of the unusual concentrations of endemic species and their threatened status, the Eastern Arc Mountains have been classified as one of the 17 most threatened tropical forest ecosystems or global hotspots, worldwide (Myers 1988, 1990; Mittermeier et al. 1998; Myers et al. 2000).

The aim of this book is to highlight the biological importance of the Eastern Arc Mountains, describe activities that are adversely affecting biodiversity, identify ecological patterns relevant to the conservation of biodiversity, and discuss site-specific activities and programs for conserving the Eastern Arc forests.

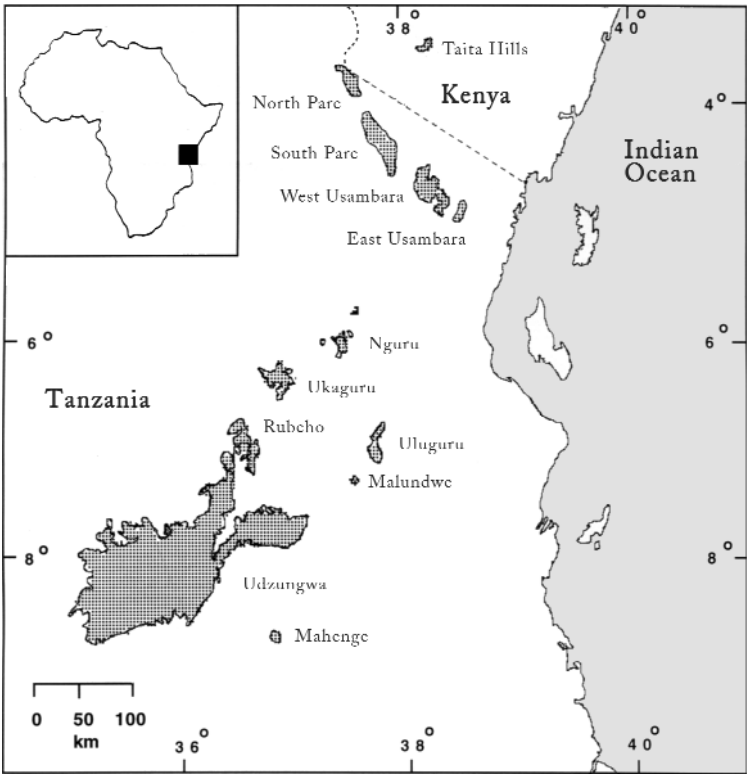


**Fig. 1.1.** Location of the Eastern Arc Mountains in Tanzania and Kenya

## 1.2 Biodiversity

Biodiversity is the totality of life in a given area and consists of three hierarchical components: genetic diversity, species diversity, and ecosystem diversity.

### 1.2.1 Genetic Diversity

Genetic diversity is the variety of genes within a species. If one were to compare two individuals of the same species in a population or between populations, they would differ. Much of this variation between individuals is a result of differences in their genetic makeup or genes.

### 1.2.2 Species Diversity

Species diversity is the variety of species found within an area. This includes plants, animals, and organisms such as fungi, protozoa, and bacteria. While there are a number of ways to measure species diversity, the simplest measurement is the total number of species in an area or species richness. Worldwide, the total number of species is unknown but is estimated to be between 5 and 30 million species (Erwin 1982; May 1990; Gaston 1991). To date, approximately 1.75 million species have been described, of which 950,000 are insects, 270,000 are plants, 75,000 are arachnids, 72,000 are fungi, 70,000 are mollusks, and 41,000 are vertebrates (Hawksworth et al. 1995; Dobson 1996). The remainder of the described species are non-vertebrate chordates, crustaceans, nematodes, algae, protozoa, bacteria, and viruses.

### 1.2.3 Ecosystem Diversity

Ecosystem diversity is the variety of ecosystems or communities within a given area. Ecosystem diversity is generally more difficult to measure than either species or genetic diversity, because boundaries of ecosystems or communities are rarely distinct. However, if consistent criteria are used in defining a community, the major ecosystems or communities of a region can be identified.

### 1.2.4 Ecological and Evolutionary Processes

Genetic, species, and ecosystem diversity are a result of the interaction between organisms and their environments. Critical components in this interaction are ecological and evolutionary processes such as predation, competition, mutualism, pollination, migration, dispersal, succession, natural selection, nutrient cycling, and energy flows. The conservation of biodiversity depends in part upon ensuring the maintenance of these important ecological and evolutionary processes. The interaction between biodiversity and ecological and evolutionary processes is what has created the biosphere – that portion of the earth's mantle in which life exists (Fig. 1.2).

I limit much of my discussion in this book to species diversity (Fig. 1.3), because we know more about this level of diversity and its conservation in the Eastern Arc Mountains than we do about genetic or ecosystem diversity. However, a number of researchers are beginning to examine patterns of genetic diversity in species in the Eastern Arc forests, and the results of their research should be extremely valuable in developing strategies to conserve biodiversity at this level. As our understanding of plant and animal communities increases,

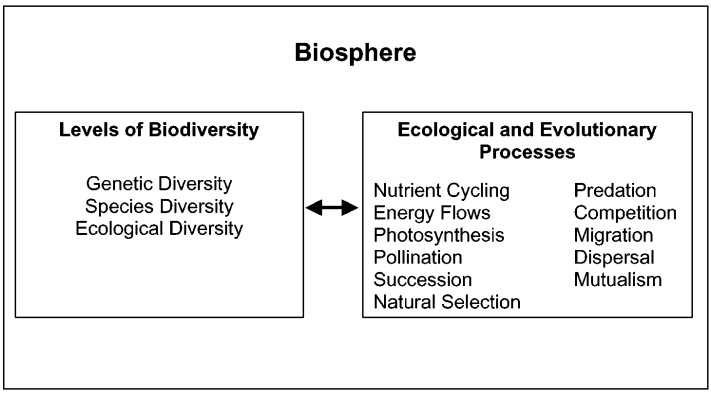


**Fig. 1.2.** The interaction between biodiversity and ecological and evolutionary processes. The biosphere is a result of this interaction. (After Reid and Miller 1989)

**Fig. 1.3.** Fruit bats are among the more important pollinators and seed dispersers in the Eastern Arc forests. Shown here is Wahlberg's fruit bat *Epomophorus wahlbergi*

we should be able to develop conservation strategies more effectively for conserving ecosystem diversity. A number of classification systems for plant communities have been proposed for the Eastern Arc forests and these continue to be refined (Engler 1894; Moreau 1935a; Hedberg 1951; Greenway 1973; Pócs 1976a; Hamilton et al. 1989; Lovett 1993).