CHAPTER 1

INTRODUCTION

The common reed *Phragmites australis* (Cav.) Trin. ex Steud. is a cosmopolitan plant species that flourishes in wetlands and will easily dominate other plant species, forming a monospecific reed bed (Den Hartog *et al*. 1989). It employs aggressive and persistent survival strategies, like most other grasses, making it one of the earliest and most successful colonisers of disturbed or newly reclaimed wetlands (Van der Werff 1991; Havens *et al*. 1997; Massacci *et al*. 2001). It reproduces most effectively by vegetative means through rhizomes and regenerative shoots that emerge from the nodes of damaged stems.

Phragmites australis is a plant species with a high annual productivity (Granéli 1984; Massacci *et al*. 2001). The biomass is produced seasonally above ground, but it also accumulates perennially in the below ground parts. The rhizome's perennating nature is based on the nutrient and carbohydrate translocation and cycling which is characteristic of all clonal plants (Hara *et al*. 1993). Nutrient and carbohydrate circulation between the rhizomes and the aerial parts occur annually, with the rhizomes supplying reserves for bud formation and growth early in the season, and the aerial parts relocating the products of photosynthesis to the rhizomes before they die off.

Two types of rhizome, horizontal and vertical, persist perennially and are responsible for the spread of the root system and the production of aerial stems respectively (Haslam 1970). Below ground expansion occurs when the horizontal rhizomes elongate and divide. The vertical rhizomes are branches of the horizontal ones, and they develop buds on the nodes that remain dormant just below the soil surface

(Hara *et al*. 1993). Below ground buds are produced year-round and can remain underground until the winter dormancy is broken. Once the growing conditions are optimal again, usually at the onset of wetter and warmer conditions, the internodes of the buds elongate and the aerial shoots emerge from beneath the soil surface. The emerging aerial shoots obtain nutrients from the rhizomes until they reach a height at which they receive enough light for photosynthesis to take place through the existing reed canopy. At this height the leaves of the reed no longer sheath the stem but differentiate and grow to gather light energy. A characteristic of the emergent shoots is that their eventual height is directly proportional to their initial bud width. The greater the diameter of the bud, the taller the reed can potentially grow. The reed can only reach its potential height if it is not damaged in any way. Damage to the shoot normally leads to the production of a regenerative shoot. Regenerative shoots may be numerous and are always shorter and thinner than the parent shoot. Regenerative shoots should not be considered as replacement shoots because they do not have the same morphometric qualities as the parent shoot, being shorter, thinner and therefore less suitable for use as construction material by rural communities.

Mature reeds produce panicles in the autumn, after the completion of the growing season. The well-developed large reeds can remain standing, even though they are dead, for up to three years. Panicles produce thousands of small seeds, most of which are not viable (Marks *et al*. 1994). The seeds are not anemochorous, being dispersed mainly by birds, animals and man. Seed germination and seedling establishment require specific substrate conditions and young seedlings are susceptible to changes in environmental conditions. The common reed grows in almost any type of soil as long as the ground is wet enough, but seems to perform best in rich mineral soils with a high clay content. This is unlike the Muzi Swamp peatlands of the study area where the soils are fine and have a high organic compound content. Van der Toorn (1972 In: Van der Werff 1991) distinguished between two different ecotypes of *Phragmites australis*. The first was the peat ecotype, which has short shoots and a high shoot density, and the other the riverine ecotype that has longer shoots and fewer reeds per unit area. Phenotypic variation in *Phragmites australis* is vast and is prominent in areas with variable environmental conditions such as water depth (Vretare *et al*. 1999). This large degree of phenotypic variation makes *Phragmites australis* an excellent candidate for re-establishment, especially if reeds with specific characteristics are required. Newly established reeds are genetically identical to the transplanted mother plant.

Many aspects of the biology and ecology of *Phragmites australis* have been investigated since the 1960's (Ostendorp 1989; Sukopp & Markstein 1989). The reason for these investigations has been either to control the spread of *Phragmites australis*, or to combat its decline. *Phragmites australis* is seen by many as a threat to biodiversity in naturally occurring wetlands, dominating other wetland plants by out-competing them for space, nutrients and light (Chambers *et al*. 1999; Mathis & Middleton 2001). Although *Phragmites australis* reed beds appear to be a monoculture, the reed does co-exist with other plant species and the reed beds provide a habitat for numerous animals. *Phragmites australis* reed beds seem to benefit only the generalist bird species, reducing the avifaunal biodiversity when compared with a wetland with more diverse micro-habitats. Micro-habitats within a single wetland such as those found in Ndumo Game Reserve can include, amongst others, open water, vegetated islands, mudflats and hygrophilous grassland. It is because of these micro-habitats that wetland systems such as those found in the Ndumo Game Reserve, which is close to the Tembe Elephant Park, have one of the most diverse avifaunal species compositions in the world. Insect species diversity, however, seems to increase in *Phragmites australis* dominated wetlands when compared with other wetlands (Chambers *et al*. 1999).

Phragmites australis is an important component in the ecology and maintenance of wetland integrity. It has many valuable attributes, such as an extensive root system that consolidates and maintains substrates, minimising the effects of water erosion. It also has the ability to withstand high levels of environmental contamination and it can assimilate heavy metals, nitrogen and phosphorous. In addition it tolerates varying degrees of salinity and acidity (Massacci *et al*. 2001). The establishment and continued existence of *Phragmites australis* reed beds in disturbed wetlands with these attributes facilitate hydrological succession, initiating the restoration of the wetland so as to render it a productive entity (Van der Werff 1991).

The global extent of wetlands has decreased substantially in the last century due to, amongst other reasons, their uncontrolled conversion to agricultural land. This has had serious effects on the environment and has also had severe social and economic impacts on natural resource users (Adger & Luttrell 2000; Hodge & McNally 2000). This is particularly important to primary natural resource users such as poor rural communities who are reliant upon such resources for their daily survival. Land use trends in the Maputaland region, where a single, locally relevant authority controls tribal land and subsistence agriculture is practised, are consistent with other economically underdeveloped regions in the rest of the world. Although this type of subsistence agriculture was practised in many African cultures over the millennia it does not necessarily mean that it did not alter the ecological conditions and environment, even dating as far back as 150 years ago (Campbell & Child 1971). These changes occurred when it was customary for people to create temporary small-scale environmental disturbances, and then to return once the area had recovered. Fabricius (2004) discussed examples of such practices, including 'pulse hunting' where animals were harvested heavily at certain times of the year and then completely left alone the rest of the time so that the population could recover. Patch burning is another type of small-scale disturbance that was used to promote fodder production for wildlife and livestock. Although this type of patch disturbance using fire as a management tool still takes place in many rural areas around South Africa, it is more prominent now because there are more and more people with herds of cattle and they burn the rangeland for grazing production. The overall result is an accumulation of a patchwork of burned areas and is generally followed by overgrazing because of a lack of immediately available fodder for livestock.

The increasingly sedentary nature of rural populations, and the resulting persistent natural resource use in a single area are in many ways contradictory to practices employed in the past. This is evident when one considers the changes to water bodies and wetlands, not only in conventionally “unprotected” tribal areas, but also in areas that are under the protection of conservation authorities. Uncontrolled harvesting of renewable natural resources such as sedges and reeds, fish and invertebrates not only affects the areas in communal land because the systemic nature of wetlands transfers the effect to protected areas too. All the naturally occurring fauna and flora in the pans, rivers and marshes in the northern sub-region of KwaZulu-Natal are under survival pressure because of an increasing intensity of human use. Diminishing fish stocks in the Kosi Bay system as well as the Pongola River are evidence of this. There also is increased pressure on nature reserve managers in the subregion to allow access to higher volumes of harvestable plant material such as Incema *Juncus kraussii*, the common reed and forest timber.

Natural resources such as these were always utilised by local rural communities, but previously this was done on a subsistence basis. The increase in human population size and a seemingly ad hoc development of rural economies in these communities has placed increased pressure on the available resources. The rural poor tend to use the resources that are freely available to them. An increasing human population leads to the amplification in the demand for the resources. Burgeoning rural economies are also responsible for an increase in the utilisation pressure, specifically if there is a demand for the resource in extralimital markets such as in large towns and cities.

The Sibonisweni community of northern Maputaland finds itself in this situation. The flourishing reed market in this area has resulted in few reeds occurring in the part of the Muzi Swamp that is situated in the communal land itself. Reeds are therefore now being harvested in the neighbouring Tembe Elephant Park, where the protection and controlled use of this resource has resulted in it being an almost pristine reed bed. Most of the Muzi Swamp in South Africa, where the reeds are abundant, is situated in the Tembe Elephant Park. The Tembe Elephant Park management grants reed harvesting permits to three neighbouring communities. Sibonisweni is the largest of these communities and as such has a far larger reed quota than other neighbouring communities. The focus of this study was therefore on the reed use within the Sibonisweni community and the harvesting area that was allocated to them in the Tembe Elephant Park. It is conceivable, however, that the results and conclusions of this study could also be applicable to the other neighbouring communities. Ezemvelo KwaZulu-Natal Wildlife recognised a need for a study on the effects of reed harvesting within this area, as it is the most heavily utilised harvesting site.

Some of the main aims of the study in the Tembe Elephant Park would undoubtedly be to promote the maintenance of the Muzi Swamp as a productive natural resource provider of these reeds, and to improve the quality of the existing resource base. To do so, the following aspects were studied:

- The biology of *Phragmites australis*
- Treatments to stimulate the growth of *Phragmites australis*, specifically fire and harvesting treatments

- Estimation of the current condition and quality of the reeds in the Muzi Swamp, Tembe Elephant Park
- Socio-economic aspects and trends of the use of *Phragmites australis* in the Sibonisweni community
- Investigation of the possible introduction of secondary industries pertaining to reed and forest timber use to the communities neighbouring the Tembe Elephant Park
- Formulation of a reed management plan and harvesting regime that does not negatively influence reed growth in the Muzi Swamp.

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