development agencies.

These systems are a unique part of Namibia's natural heritage and if well managed, can serve a wide variety of users. By developing a better understanding of their dynamics and raising the awareness in regard to their functioning, I hope to ensure that the linear oases of the Namib will remain intact as unique and valuable features in Namibia's landscape. In the meantime I'm watching the eastern sky as the clouds are beginning to build, setting the stage for more flooding in the Kuiseb River!

FUNGI IN THE DESERT?

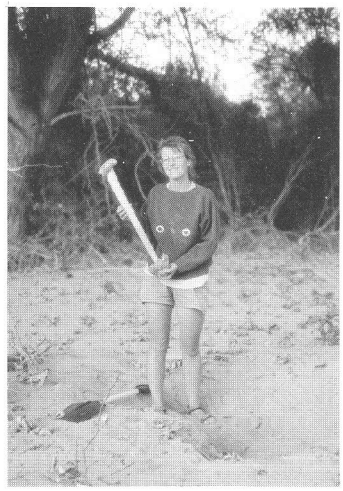
by Kathy Jacobson

Yes, fungi do occur in the Namib Desert, and, at times in great abundance! We typically think of fungi as inhabitants of moist environments: helping or hindering tree growth in tropical or temperate forests, decomposing wood in damp houses, rotting cheese or vegetables in the refrigerator, or perhaps providing irritation between our sweaty toes. Most people are surprised to find out that, like plants and animals, different types of fungi have adaptations that suit them for growth and reproduction in the desert environment. Of particular interest to me is discovering how the bizarre and wonderful adaptations that these fungi possess allow them to cope with the stresses of the desert ecosystem and how these fungi contribute to nutrient cycling processes in the hyper-arid Namib Desert.

The fungi which I am concentrating my studies on are either decomposers of different types of plant material, or are mycorrhizal with various plants. Mycorrhizal fungi are associated with the roots of most land plants, obtaining all of the carbohydrates necessary for growth and reproduction from the plants, and in return, assisting the plant with its uptake of moisture and nutrients. Thus in desert environments, which are generally nutrient and water deficient, mycorrhizal associations are of particular importance to their plant hosts.

While mycorrhizal fungi have been described from most biomes, our understanding of how abiotic and biotic parameters structure mycorrhizal communities within these biomes is very limited and based largely on extrapolations from artificial systems. This is because of the difficulties associated with differentiating between cause and effect in complex ecological settings, and the difficulties of working with subterranean organisms which are difficult to culture.

For my dissertation (Ph.D completed in 1992), I conducted a simple ecological study across the climatic gradient of the hyper-arid Namib dune field. This allowed me to differentiate between the effects of abiotic and plant symbiont factors on the distributional ecology of VA-mycorrhizal fungal communities. My studies showed that moisture and substrate stability, rather than the plant symbiont, were the primary factors determining the distributional ecology of the five most abundant VA-mycorrhizal fungal species in the Namib dune field. I am currently investigating whether the moisture effect is experienced directly or indirectly (through the plant symbiont) by the fungus, resulting in observed changes in root colonization and phenology. This is the first study of VA fungal phenology in association with seedling phenology in the natural environment, and by conducting soluble carbohydrate analysis of the plant roots, I hope to test hypotheses currently in discussion concerning plant cues that stimulate mycorrhizal formation in the plant roots.



Dr. Kathy Jacobson with a large specimen of the Fungus, Battarrea from the banks of the Kuiseb River.

In addition to contributing to our basic understanding of mycorrhizal associations, these studies have important implications for our understanding of mycorrhizal functioning under conditions of stress. The fungi and plants I have studied to date are experiencing natural conditions of drought and instability. I am now extending my studies to other arid regions of Namibia where past and present stock grazing regimes provide opportunities to investigate fungal ecology in response to anthropogenic disturbance.

In addition to mycorrhizal fungal ecology in the Namib, I am also investigating desert Basidiomycete

ecology, fruiting phenology, and population biology. Close relatives of mushroom species, these bizarre macro-fungi have numerous adaptations facilitating their survival in a hyper-arid environment generally assumed to be inhospitable to the fungi family. Eight diverse taxa are known from the Namib desert; all show similar adaptations to high levels of desiccation, sand and wind. In addition to ongoing studies of the phenology of these fungi in response to rain, I am investigating the population biology of one species which occurs exclusively in gemsbok middens where it decomposes dung buried beneath the sand. Preliminary data suggests that midden populations are composed of numerous individual mycelia, and that middens separated by more than 2 km are distinct genetic entities.

Helping my husband and fellow DRFN associate, Peter with his fieldwork in the Kuiseb catchment area, provides an ideal opportunity to collect and describe the unique fungal floras associated with episodic flows of the ephemeral rivers in the Namib. After flood waters subside, fungi can be found decomposing organic matter buried in the silts, small branches stranded in the debris zone and organic debris of all sorts caught in log jams. This year Peter and I hope (weather permitting) to conduct a comparative study of the decomposition rates of fungi that specialize on buried organic material in the Kuiseb River and the adjacent dune field.