



CROCODILE AND HIPPOPOTAMUS MANAGEMENT IN THE LOWER SHIRE

**DOCUMENT 18
OCTOBER 2000**



Community
Partnerships for
Sustainable
Resource
Management in
Malawi

Crocodile and Hippopotamus Management in the Lower Shire

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USAID Contract: 690-C-00-99-00116-00
Activity: 612-0248

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ACRONYMS

BVC	Beach Village Committee
CBNRM	Community-based Natural Resource Management
CE	Chief Executive
CITES	Convention on International Trade in Endangered Species
COMPASS	Community Partnerships for Sustainable Resource Management
CURE	Coordination Unit for Rehabilitation of the Environment
DA	District Assembly
DEC	District Executive Committee
DDC	District Development Committee
DFO	District Forestry Officer
DPNW	Department of National Parks and Wildlife
EIA	Environmental Impact Assessment
ESCOM	Electricity Supply Company
GVH	Group Village Headman
IGA	Income Generating Activity
IUCN	The World Conservation Union
LSNRCC	Lower Shire Natural Resources Co-management Committee
MK	Malawi Kwacha
MT	Million Tonnes
NGO	Non-Governmental Organization
SUCOMA	Sugar Company of Malawi
SVADD	Shire Valley Agricultural Development District
TA	Traditional Authority
USAID	United States Agency for International Development
VNRC	Village Natural Resource Committee
WSM	Wildlife Society of Malawi

ACKNOWLEDGEMENTS

I wish to thank Dr. Watson, Chief of Party COMPASS for his patience and invaluable guidance through the survey.

My sincere thanks go to Leonard Sefu, Sloans Chimatiro, Haxwell Jamusana and Roy Bhima for their support.

Special thanks to TAs Kasisi, Ng'abu (Chikwawa), Tengani, Mbenje, Ng'abu (Nsanje) and Chimombo, Group Village Headmen Chibuli and their community members too numerous to list here.

EXECUTIVE SUMMARY

News of human – wildlife conflict in the Lower Shire has reached the press throughout the world with crocodiles featuring high on the list of problem animals. The reasons for the high rate of conflict are many but most relate to the fact that people cannot avoid close contact with these animals since they rely on the River Shire and the adjacent marshes for their livelihood.

Lower Shire communities depend on wetlands for livestock production such as goats and cattle, which are a source of monetary income and contribute 70% in meat production in the country. Maize, sweet potatoes and other crops consumed locally and in nearby towns such as Blantyre are produced from the wetlands throughout the year. Riparian community members move from one place to the next by canoes/boats. The majority of them use tiny canoes with very little freeboard. After Lake Malawi, the Lower Shire wetlands have the second largest number of exploitable fish species. As a result the fishing industry is one of the economic driving forces in the Lower Shire. The majority of people along the Shire depend on the river and marshes for their water supply. The river and the adjacent marshes are good habitats for crocodiles, hippos and waterfowl. It is generally believed that crocodile population is increasing while that of hippos is decreasing.

The River Shire is without doubt the lifeline of people in the Lower Shire. The river and wetlands, however, have to be shared with the wildlife that is found there. The riparian environment has been altered by cultivation to the extent that wildlife has lost its natural source of food. Hippos come out to graze on crops and crocodiles take or injure people as they fish, wash clothes, tend crops, bathe or fetch water while standing in water and travel in canoes with very little freeboard.

Possible solutions to the problems include, first, reduction of crocodile populations' which can be done only after establishing crocodile/hippo populations to warrant culling and sale of wildlife products in conformity with international agreements to which Malawi is a signatory. A review of recent records shows that revenues from the sale of crocodile skins can be substantial: in 1997 over \$23,000 was generated from the sale of 200 skins. Second, improve crocodile/hippo habitat that will facilitate availability of their wild natural food such as forage for hippos and small animals for crocodiles. A management system (co-management) that allows communities to decide on initiatives and benefit from conservation and utilization of the crocodile and hippos will reduce human/wildlife conflicts through a change in the current negative attitudes to ones that are positive. Provision of wells boats and irrigation schemes away from the marshes is a very practical and effective strategy in reducing human crocodile attacks. To be able to conserve natural resources and keep away from trouble, people need to know how their environment works. Public awareness and information focusing on crocodile/hippo behaviour and the necessary safety measures must be intensified extensively among the riparian communities.

The findings and recommendations presented in this report were reviewed at a stakeholder forum held at Ryall's Hotel in Blantyre in September 12th 2000. The outcome, recommendations and action planning that resulted from this meeting are presented as an annex to this document (Annex 2).

1.0 INTRODUCTION

In recent months the issue of human-animal conflicts in the Lower Shire has reached the press not only in Malawi but also throughout the world. Reports of local people being killed by crocodiles have appeared even in small-town newspapers (for example the *Gainesville Sun* in the United States of America) and prompted a team from National Geographic to come and conduct a short survey on crocodiles and hippos and make a film on their impact. The reasons for the high rate of injury of more than 200 people annually and perhaps 60 deaths a year, (Community Survey, 2000) are numerous but most relate to the fact the people cannot avoid close contact with these animals since they rely on wetlands for their livelihoods. Most people spend a lot of their time farming close to the river and marshes, fishing, washing and bathing in the water bodies of the wetlands.

The newspaper and radio stories carry is one of tragedy and hopelessness. There is, in reality, an opportunity in the Lower Shire to promote community-based management of wildlife that could lead to the generation of tangible economic and social benefits for the affected communities. Consequently, the purpose of this report is to provide draft guidelines for the management and sustainable utilization of the hippos and crocodiles with the full participation of communities living in the areas where the animals occur. Based on the guidelines provided, communities or community representatives are encouraged to actively participate in discussions to fine tune the guidelines and contribute towards drawing up of an action plan for implementation of the guidelines.

2.0 THE SETTING

2.1. Location and Characteristics

The area lies between 34° 45' - 35° 15' E and 16° 00' - 17° 15' S. Its boundaries are well defined by dominant physical features. To the east the intensely eroded Thyolo Escarpment rises steeply as a wall-like mass. To the north the boundary is marked by Kapichira Falls and on the west the valley is bordered by the low lying hills that include the southern most end of the Kirk Range, the Matandwe hills in the south west and the Namalombo hills extending south wards from Bangula (see Fig. 1)

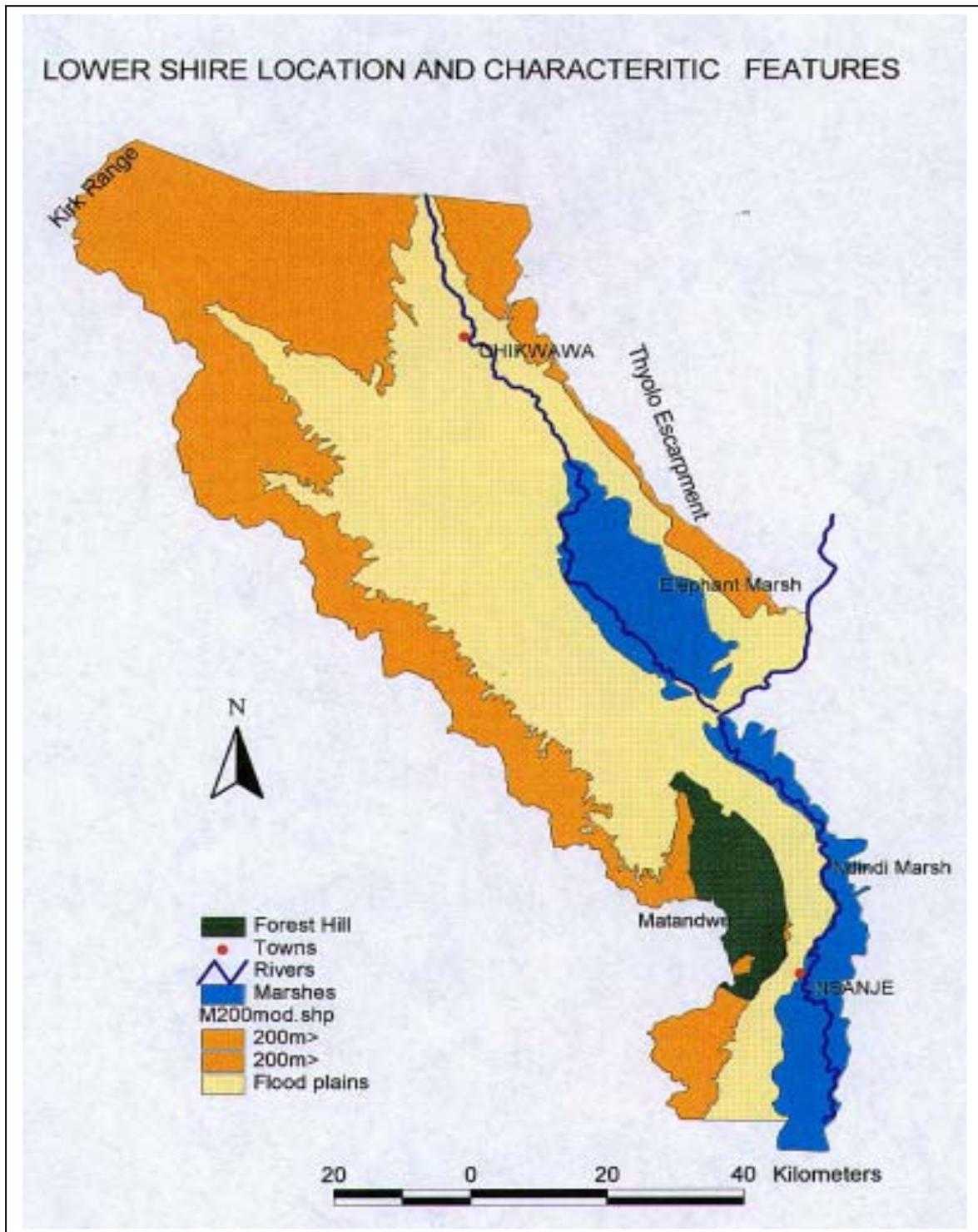
Dominant characteristic features of the Lower Shire are the River Shire itself running the entire length of the valley, the Elephant, Eastern, and Ndindi Marshes. The Elephant Marsh extends from south east of SUCOMA Sugar Estate to Chiromo covering a total area of about 473 km². The Eastern Marsh, though in Mozambique, is of significant ecological and socio-economic importance to Malawi. Ndindi Marsh stretches from south of Nsanje Boma to Marka, the southern border with Mozambique, covering an area of about 150 km². The average altitude of the valley floor is estimated at 107 m around Chikwawa, 91 m around Ng'abu and 61 m at Nsanje (SVADD, 1975). The Elephant, Eastern and Ndindi marshes are, however an exception to the estimates above in that they occupy the lower parts of the Shire valley with an altitude of about 50 m above sea level. This has made flooding endemic in the marshes with discharges from the Ruo and other tributaries.

2.2 Climate

Climate is fairly uniform in the Lower Shire. It is characterised by high temperatures and two well-defined seasons. The dry season is from May to October and the wet season is from November to April.

Rains are generally low and erratic with the onset dates varying significantly from year to year. While the Thyolo-Chikwawa escarpment receives 800-1130 mm of rain a year, lowlands on the west bank only get 650-750 mm (Mwafongo, 1998). In good years the valley receives light rains from April to July caused by the intrusion of moist maritime air from the Indian Ocean. The rains are crucial for winter crop production.

FIGURE 1: Physiographic Features of the Lower Shire



Maximum mean monthly temperature is 27.2°C in October. The hottest months are October and November. The mean monthly minimum varies from 22.8°C in January to 13.3°C in late October (Mwafongo, 1998).

2.3 Soil

The distribution of soils in the study area is mainly governed by landforms, while parent material, hydrology and vegetation have also exerted a measurable influence. Consequently, the distribution pattern of the soil is complex. However, much of the soil distribution pattern is strongly controlled by the two distinct landforms: the Rift Valley Scarp Zone and the Rift Valley Floor. On the Rift Valley Floor, the influence of hydrology can be seen through its effect on alluvial deposition, while elsewhere the soil type reflects the parent materials from which it is derived. In the Rift Valley Scarp Zone, soils are characterised by lithosols, ferruginous and terrallitic soil groups while on the Rift Valley Floor calcimorphic soils, vertisols and mopanosols dominate (SVADD, 1975)

2.4 Land Tenure

There are three categories of land tenure in Malawi; Customary, Private and Public (Chaweza, 1998). The President, who delegates his authority to the chiefs - Traditional Authorities (TAs), holds customary land in trust for all the people of Malawi. The land is commonly held and distributed to the people by local chiefs. Customary land forms about 70% of total land area in Malawi. Smallholder cultivation is mainly done on customary land (Chaweza, 1998). Private land is either freehold or leasehold and often under commercial cropping (Chaweza, 1998). Public land is land under infrastructure, forestry, Wildlife Reserves and National Parks (Chaweza, 1998). A large area of the Lower Shire valley wetlands falls under customary land and is heavily cultivated.

2.5 Value of Wetlands (Lower Shire)

The term "wetland" is used here to mean an area with water that is near, at or above the level of land including marshes and swamps. This could be natural or man made, permanent or temporary with water that is static or flowing including areas of emergent vegetation.

Lower Shire wetlands represent some of the most valuable and productive ecosystems in Malawi. They provide fresh water for human consumption, forage for livestock, fertile soils for crop production, means of transport and an important fisheries industry. They are also a home and source of food for a variety of wildlife including crocodiles, hippos, waterfowl and other migratory birds. Below are brief descriptions of the values.

2.5.1 Livestock Production - The Lower Shire has a variety of livestock that include cattle, goats, sheep and chickens. Cattle and goats, at an estimated population of 76,170 and 156,000 respectively, are the most important livestock. They are a source of monetary income, manure, milk, and bridal dowry and contribute to about 70% in meat output in the country. The marshes and riverside flats provide excellent fodder and watering points. Grass in these areas is palatable, grows luxuriantly and water is abundant and readily available. Grazing is, however, best on the wetlands during the dry season. This unfortunately coincides with the breeding season for crocodiles, a period when they are most active and aggressively protecting their nests or hatchlings (TAs Tengani, Kasisi, Chimombo and their communities, pers. com., 2000). Most reports of livestock being taken or injured are during these dry periods. This is again a time when there is no water elsewhere excepting in the River Shire and the marshes.

2.5.2 Crop Production - Factors that commonly constrain food production in the Lower Shire are low and erratic rains, high temperatures (heat stress), drought, declining soil fertility and high costs of inputs. Solutions to environmental limiting factors cited above are found in dimba (wetland)

cultivation. Dimbas (wetlands) in the Lower Shire provide optimum conditions for crop production in an otherwise semi-arid environment as they provide year-round moisture and fertile alluvial soils.

In good years when the residual moisture of the dimbas is supplemented by "mawawa" (drizzles) from May to July, dry season crop yields almost double compared to rain fed summer crop. Average maize yields from dimbas for example is 2500 kg/ha unlike the 1500 kg/ha rain-fed summer crops. Average sweet potato yields from dimbas during the dry season is K1600 kg/ha while summer, rain fed, average is K800 kg/ha (Mwafongo 1998). Furthermore, dimba cultivation enables food production and availability to be spread over a greater part of the year. This ensures regular supply of fresh foods and minimises storage losses.

Many wetland and upland households have agriculture plots in the dimbas and derive most of their food supply from dimba cultivation. Smith et al (1998) estimates, the rural population potential utilising the river Shire wetlands at 460,000 which is 59% of estimated total population of both Chikwawa and Nsanje. This population estimate gives a density of at least 180 people per square kilometre with the populations still growing at 3.7% per annum. This rapidly increasing population and accompanying resource utilisation, have resulted in degradation of the wetland ecosystems. Apart from population growth at local wetland ecosystems, influxes of people from uplands and other districts have exerted additional pressure on the wetlands. Many farmers, as a result, occupy and cultivate fragile marginal lands such as swamps and riverbanks. Lower water levels due to drought and river flow regulations by a barrage and dams; have facilitated the settlement and utilisation of marshes creating further stress on wetland ecosystems. Those who do not have enough space on one bank cross the river to cultivate on the other. Crossing is normally by small dugout canoes that are often over-loaded. Many farmers are taken by crocodiles or injured as they cultivate near the riverbanks, draw water to irrigate their crops or when crossing the river to gardens on the other side of the river.

2.5.3 Water Supply - Many of the estimated 460,000 people or 92,000 households in the wetland do not have access to piped water, wells or any other form of protected water sources. They depend on the Shire River, flowing channels in the marsh, flooded backwaters, and pools for their water supply. A few lucky villages are provided with shallow wells or boreholes that are working but many have ended up with wells that are dry, broken or have salty water. This means that many men, women and children from villages adjacent to the river/marshes that do not have wells or have wells that are no good are forced to go to the river to fetch water, take a bath or wash clothes. All the villagers along the Shire know about the presence and dangers of crocodiles in the Shire River and the adjacent marshes. Despite their awareness about the possible attacks, one sees people wading, sitting or standing in the river to draw water, wash or take a bath. Mothers carelessly allow their children to splash in the water. This behaviour leaves most villagers, adults as well as children vulnerable to crocodile attacks.

Traditional precautions like building bamboo/reed fences (nchinga) to enclose sections of the river so that people can safely wash and draw water from within the fence have been tried but they are no longer working. With time crocodiles have learnt to dig under the fences and wait in ambush for the unsuspecting victims from within the enclosed area (TA Kasisi, pers. com., 2000). Use of "mphinga", a gadget made of a pole, about 3 metres long, with a container for drawing water attach to one end of the pole is another traditional safety measure that used to work but no longer now. Here again crocodiles have learnt from experience that if they quickly and vigorously pull on the container they will drag their prey holding on to the other end of the pole into the river. Several women have been pulled into the river and attacked in this way (TA Kasisi, Chimombo and Tengani, pers. com., 2000).

A possible workable solution to this problem is one that will reduce the peoples' dependence on the river and marshes for their water supply.

2.5.4 Transport - The River Shire and all flowing channels in the marshes are used for travel and transportation of materials. Many people living along the Shire use canoes or boats to move from one point to the next. At Bilitinyu, almost all of goods for sale in Mozambique and vice versa are transported by river. The problem is that the majority of vessels used are canoes that are unstable and have very little free board.

2.5.5 Wildlife Habitat (Crocodiles and Hippopotamus) - The Elephant, Eastern and Ndindi Marshes have major river channels, deep open water lagoons/oxbow lakes, low lying marshes with numerous small streams and occasional sand and mud banks, shallow water areas with aquatic macrophytes, delta regions where major streams divide into numerous channels with large islands and sand banks. All these marsh/river characteristics described above are excellent habitats for both crocodiles and hippopotamus.

Hippos rest in the deep pools during the day and go out to graze in the riverbanks at night. Crocodiles wait for their prey in the marshes, take it easy in the open waters and come out to bask on the sandbanks where they also build their nests and lay eggs.

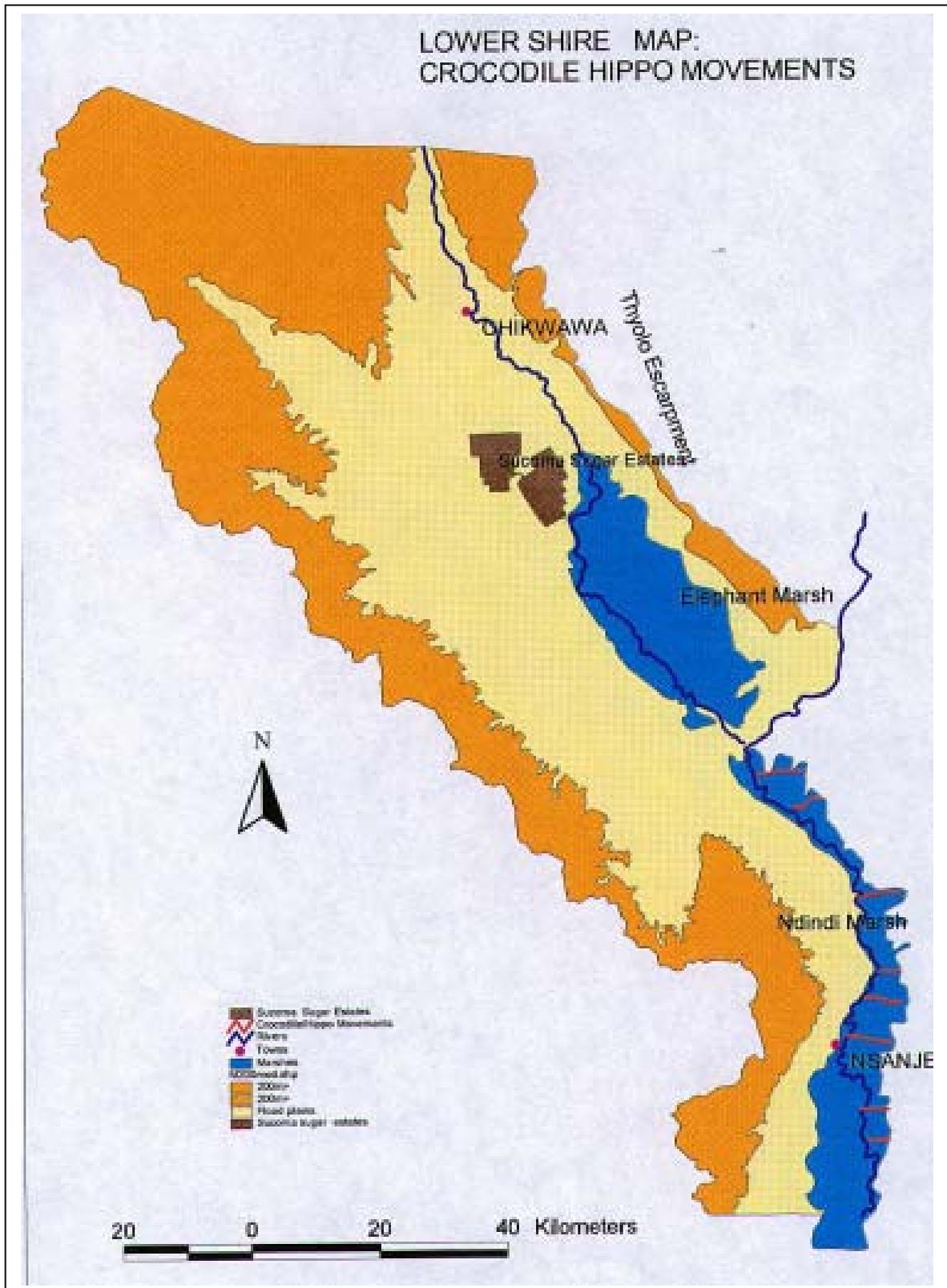
There is a lot of crocodile and hippo movement between the Shire River and Eastern Marsh and between the Malawian and Mozambican sides of Ndindi Marsh (TA Tengani, TA Ng'abu, TA Chimombo, pers com., 2000). It is observed that in the dry season many crocodiles and hippos from Malawi migrate to Mozambique and in the wet season, when the water level is high, they move back to Shire and Malawi Ndindi.

Traditional Authorities Tengani, Chimombo and their communities argue, based on the number of sightings and frequency of crocodile attack incidences that crocodile populations have increased compared to 15-20 years ago. Lower Shire communities believe there are several thousands of crocodiles in the Shire, (Bhima and Jamusana, 1998, Community Survey, 2000). Bruessow (1989) estimated breeding females in the Lower Shire at 168. In their 1998 survey, Bhima and Jamusana estimated crocodile population at 932. This is an under estimate from just the main river excluding a member of channels in the eastern bank of the Elephant Marsh. The team was unable to carry out night counts in Kapichira Falls – Chikwawa Bridge segment (9.3 km), SUCOMA – Alumenda segment (10.7 km) and Nyakasume-Bitilinyu segment (see Fig. 2). These segments are known to have high crocodile population densities. Migration and emigrations of crocodiles in both the Eastern and Ndindi marshes were also not taken into consideration. Jamusana and Bhima (1998) note that segments of the river with high hippo, crocodile and human densities have the highest conflicts. Communities along the Shire from Kapichira to Mauka in Nsanje claim that they see a good number of hatchlings, juveniles and mature crocodiles in the river. They admit, however, that the population of hippos is decreasing and that the hippos need protection. Communities realize that hippos play a crucial ecological role in building fish populations through fertilization of the river with droppings and opening up water channels for aeration creating favourable conditions for fish multiplication and growth.

Wildlife population especially those of hippos, have generally been seriously reduced in some wetland areas in the Lower Shire due to a variety of factors, including poaching and elimination of habitat through farming. Wetland farming competes with wildlife foraging and breeding. Encroachment on natural habitats has brought down not only the population of hippos but fish too. Human-crocodile conflicts occur, due in part to low fish populations in the wetlands. In the absence of fish and wild animals, hungry crocodiles look for alternative sources of food and turn to goats, cattle and people. Likewise, hungry hippos turn to farmers' maize, rice and pumpkins in the absence of their favourite grass.

Migrations of hippos and crocodiles, their habitat and age-structure need to be examined carefully for development of meaningful sustainable conservation and management plans.

FIGURE 2: Crocodile and Hippopotamus movements in the Lower Shire



2.5.6 Habitat for Water Fowl/Migratory Birds - Although most of the Elephant and Ndindi Marshes have lately been heavily cultivated, there are some small sections here and there that are still intact as true marshes. Muona and Chiromo in the eastern bank of the Elephant marsh and Mchenyera on the west bank near Bangula are among the few remaining true marshes. These environments offer excellent sanctuaries to waterfowl and migratory birds. Sixty-four (64) bird species including the White Pelican utilise the Elephant Marsh.

A significant number of bird watchers from within the country and abroad come to Muona-Chiromo, Nchenyera, and other parts in the wetland. Local guides take around the bird watchers in small unstable canoes. Most of the guides have never been to school but they know and correctly name most birds in the marsh by their scientific names.

Almost all the bird watchers to Muona-Chiromo and Nchenyera are day visitors. Many have expressed interest to spend nights in these areas but can not do so due to lack of facilities like rest houses and restaurants.

Communities at Muona-Chiromo, near Fatima Hospital are interested in building a simple rest house for visitors. They have already molded bricks. All they need is assistance in funding for construction of the structure.

Local people are already running some eco-tourism ventures. They need to be assisted to improve on what they are doing already. A major threat to the industry, however, is destruction of the habitats through cultivation in very dry years. A possible solution would be to elevate all the major waterfowl habitats that are currently under customary land (and not protected) to public land designated as protected waterfowl sanctuaries.

2.5.7 Fish and Fisheries Industry - After Lake Malawi, the Lower Shire wetlands have the largest number (12) of exploitable fish species (Smith *et al.*, 1998). All the commercially utilised species use shallow flood plains, channels and lagoons for breeding. Marsh islands are used for safety.

Fish and fisheries play a major role in the economy of the Lower Shire. Using the 1996 - 97 average price index of MK10/kg, Chimatiro and Mwale (1998) demonstrated that Lower Shire fishing communities made MK100, 000 million from 10,000 MT of fish landed in 1991. In 1996 1800MT of fish were landed generating MK18 million for the communities. Despite a downward trend in fish catches and income, the fishing industry remains one of the economic driving forces in the Lower Shire. Fish is also the major source of dietary animal protein in the area.

Most households along the Shire River and its adjacent marshes fish to some degree. They use a variety of gear that include gill nets, fish traps, hooks, cast nets, scoop nets, seine nets and fish spears. Fish spears are used in the wet season when fish are all over in the flood plains. Ninety per cent (90%) of fish caught are two species of clarias (mlamba). They are *Clarias ganiepinus* and *C. ngamensis*.

Some fishers take precautions against crocodile attacks by using big canoes standing on platforms (ntchinga) or raised riverbanks when fishing. Others leave it to chance by using small dugout canoes or standing in the water. The latter group of fishers is the one that often experiences conflicts with crocodiles and hippos.

Aquatic weed infestation, increased numbers of fishers, over-fishing and widespread siltation of fish breeding grounds from agricultural run-off are among factors that have led to a decline in fish catches. There is a need to establish up-to-date information trends on fish populations and fisheries that will help in building up fish populations through habitat management, use of appropriate gear, establishment of fishing seasons together with communities. The Department of Fisheries is already

addressing some of the problems. Other relevant departments, such as Agriculture, need to work in close collaboration with Fisheries.

3.0. CROCODILES AND HIPPOPOTAMUS – A BRIEF ECOLOGY

3.1 Crocodiles - Nile Crocodile

There are about three commonly known crocodile species in the world including the Nile crocodile, which is known to be restricted to north-east and south east Africa. Crocodiles are among the largest of the modern reptiles and the last surviving reptilian descendants of the stock that also produced dinosaurs. They are believed to have been around for over 160 million years (Barr, pers com., 2000). Crocodiles have managed to survive this long because they are capable of hiding, eating and reproducing. Life expectancy for the Nile crocodile ranges from 60 years in captivity to 100 years in the wild. The Nile crocodile is the major killer of humans among all other wild animals in the Lower Shire. As a result, it is the most feared and hated.

The Nile crocodile normally reaches sexual maturity at about 12-15 years. At this time the crocodile will have grown to 2-3 metres long (snout to tip of tail) and attained about 70-100 kgs. The breeding season starts in May with elaborate courtship. Mating takes place in water in July to August.

The female selects a sunny sandbank that is above flood water level, with good drainage and cover nearby. Unless distributed, the nest will be used for the rest of her life. Nests are dug with hind feet at night usually in November. Forty to fifty hard-shelled eggs are laid in the nest on average by first layers. Big crocodiles may lay more (TA Tengani, pers. com., 2000). The eggs are covered with 30 cm of sand. Hatchlings measuring 28 - 32 cm emerge after 84 - 95 days. Because young crocodiles cannot dig away 30 cm of sand above them, the mother digs the nest at a first call from the young ones in the eggs. The mother protects the hatchlings in a quite backwater for 6 - 8 weeks.

Young crocodiles spend a lot of time out of water and eat small prey including insects. Sub adults are often found in swamps and backwater eating fish, birds and small mammals found along the riverbanks. Adults eat almost anything but regularly feed on fish, particularly catfish, swimming birds but also ambush game coming to the water to drink. Small antelopes are taken as well as buffaloes at times. Big prey are often taken to tunnel-like dens with a below water entrance slanting up into the shore above the water line where they are left to rot. These tunnels often have air vents in the roof. Digestive juices for crocodiles are so strong in hydrochloric acid that they are known to dissolve spearheads, steel hooks and other pieces of iron swallowed by accident.

Crocodile have two deadly weapons - terrible jaws and a powerful tail. A strong side blow of the tail can knock down and break the legs of an antelope such as a duiker or nyala. Their favourite, however, is the "stealth" attack on their prey. Here the crocodile drifts unseen, without a sound and without creating ripples in the murky, shallow water, submerges itself entirely (close to its prey) and then makes a swift attack to seize the prey with its vice-like jaws. The stealth attack is possible because of the elevated eyes and nostrils that peep above the water surface while the rest of the body is submerged. Besides the elevated eyes and nostrils, the crocodile has embedded in its eyes thousands of tiny crystals that collect all possible light giving the crocodile an amazing eyesight under water even at night (The Readers Digest, 1969)

The crocodile's sharp sight in murky water during the day and at night, and their ability to approach and attack their prey undetected has led them to be surrounded by many myths. Some people believe that all the crocodiles that attack humans are supernatural ones; others believe that crocodiles will take humans by either physically catching them or simply grabbing their shadows on the water.

In environments where there is plenty of food, fish and wild animals, crocodiles are known not to deliberately and regularly attack humans. But where crocodiles' natural prey has been largely depleted they quickly shift to attacking human beings.

Despite their impressive survival success, crocodiles have a number of predators at various stages of their life. Snakes, hyenas, monkeys, monitor lizards, birds of prey and sometimes human beings, eat eggs. Storks, cranes, monitor lizards and large fish, especially catfish, prey on young crocodiles. With all these hazards it is estimated that in natural environmental settings that are not disturbed, only one percent of the eggs laid ever become mature crocodiles (The Readers Digest, 1969)

3.2 Hippopotamus (*Hippopotamus amphibius*)

The common hippopotamus (*Hippopotamus amphibius*) is one of the three largest living land mammals. A fully-grown male can weigh up to 3500 kgs, measuring 4 metres long and 1.5 metres in height at the shoulder (Jamusana, 1994). Males continue to grow throughout their life.

Though highly aggressive and territorial, hippos have very flexible social systems defined not only by hierarchy, but also by feeding and water conditions (Jamusana, 1994). Hippos are normally found in groups of 15 but in time of drought big rafts of 200 are forced to congregate in the few remaining pools.

High hippo population densities are found in areas of shallow water with access to open grassland. This is because despite hippos spending most of their time in water, they normally do not feed on the aquatic vegetation. They are almost exclusively terrestrial grazers although in some areas they can be seen feeding on aquatic vegetation (Jamusana, 1994). They emerge from the water each night to graze on land. They prefer short grass within a few kilometres of permanent water. More than half of the grass composition in the diet of hippos is of those grasses immediately adjacent to the river banks (Jamusana, 1994)

Today the rapidly increasing human population in the Lower Shire has resulted in increased agricultural activities and accelerated the rate of encroachment into hippo feeding areas. The first vegetation hippos come across as they emerge from the river is either maize or rice. Left without alternative wild forage, hippos graze on the maize and rice causing hippo/human conflict.

Crop raids are more frequent on the gardens within 0-100 metres from the riverbanks (Jamusana, 1994). The frequency of raiding as well as the rate of damage decreases with the increased distance from the river. If encountered away from safety, anything that gets between them and their refuge may be bitten or trampled to death. Many serious accidents result from these unexpected encounters as people chase the hippos from their gardens.

The problem of crop damage, loss of life or injury is experienced throughout the year because of the double cropping system in the Lower Shire. The degree of crop damage has, however, gone down with the drop in hippo population.

4.0 NATIONAL WILDLIFE POLICY

The policy recognises that wildlife is a renewable natural resource with a range of positive and negative values. The government purpose therefore, is to manage wildlife resources professionally to maximise positive attributes while minimising the negative ones. It further considers wildlife conservation and management as a legitimate form of land use that can be superior to other land use schemes given an appropriate institutional framework.

The goal of international wildlife policy is to ensure proper conservation and management of the wildlife resources in order to provide for sustainable utilisation and equitable access to the resources and fair sharing of the benefits from the resources for both present and future generations.

In order to achieve the stated goal above, the Malawi Government has come up with a clearly stated objective as follows:

- 1) Ensure the adequate protections of representative ecosystems and their biological diversity through promotion and adoption of appropriate land management practices that adhere to the principle of sustainable use.
- 2) Enhance public awareness and understanding of the importance of wildlife conservation and management and its close relationships with other forms of land use.
- 3) Take the necessary legislative steps as well as pertinent enforcement measures to curtail the illegal use of wildlife.
- 4) Create an enabling environment for wildlife-based enterprises.
- 5) Develop a cost-effective legal, administrative and institutional framework for managing wildlife resources without compromising the special ecological attributes of the resources.

The Malawi government in particular recognises that wetlands are extremely valuable, yet fragile ecosystems that have high biodiversity and international importance especially for migratory birds. It further states that it is in the interest of the government to maintain and enhance the ecological value of the wetlands with the full participation of stakeholders especially at the local level. The government clearly spells out its commitment to enhance collaborative management of wildlife resources. It is also being very open by clearly stating that collaborative management entails sharing of benefits, accountability and decision making among stakeholders, who are to assume clearly defined rights and responsibilities. To show their commitment, the Department of National Parks and Wildlife held a six-day workshop where establishment, composition, roles and limits of co-management institutions were discussed. Below are government strategies that are meant to help with the successful wetlands conservation and management;

- 1) Assist in the inventory of major wetland habitats in the country including their state and integrity.
- 2) Identify all relevant institutions and stakeholders at national and local level and subsequently establish regular communication and co-operation links with them.
- 3) Facilitate the coordinated development of guidelines and management plans for all major wetland habitats.
- 4) Establish and implement appropriate mechanisms for monitoring and, if necessary, adjusting wildlife-related activities.
- 5) Ensure conformity with the provisions of relevant international conventions (for example, the Ramsar Convention)
- 6) Lobby for including aspects of the catchment area protection and water extraction control in the framework of wetland management.

4.1 Community Empowerment (Co-management)

Ownership of wildlife resources rests in the State President on behalf of and for the benefit of people of Malawi. However, DNPW's recognition of the need to give utilisation rights and responsibilities to communities that legitimately use the land on which the resources occur is a positive approach towards empowering local people for conservation and sustainable utilisation of the natural resources.

It is clear from the policy that DNPW realises that consideration of the people concerned needs to come foremost in all sustainable environmental problem-solving strategies. This is because individuals and groups of people or communities have their own ways, organisational patterns, perceptions of needs and desires to help plan and implement changes that will affect their own lives and those of generations to come. The mere fact that communities are given a chance to have a sense of ownership and be able to decide and make plans about conservation and utilisation of resources around them will bring about a change in their lifestyles. They will, most likely, adopt a sustainable lifestyle in which community members will consider themselves as parts of the environment and not manipulators of the environment. It is a lifestyle that will have communities in the Lower Shire, recognise that natural resources are finite and generate in them the commitment to caring and proper use of the resources. Such a lifestyle does not merely stop bad things from happening but also encourages good things to happen. Co-management is a management system that allows community members to participate in decision making on how to conserve and sustainably utilize natural resources. Moreover, the communities or stakeholder groups can realize genuine benefits from the managed use of natural resources. In principle, strategies could be implemented that allow local communities in the Lower Shire to realize monetary benefits from the official culling of wildlife¹. The system is probably the best alternative to centralized natural resource management because it integrates the experiences gained by communities in resource use with scientific advice and policy considerations. It is indeed, a necessary transition from destructive utilisation of resources, characteristic of regimes that depend on isolation and use of force to sustainable use of the resources.

5.0 CONSERVATION STRATEGY

Consultations with riparian communities reveal that human/crocodile/hippo conflicts often take place when people are working in their riverbank gardens, fetching water, fishing while standing in water, bathing or washing in the crocodile-infested river. Those using small dugout canoes for fishing, crossing or traveling along the river have their boats overturned by hippos. While in water they are taken by crocodiles. Sometimes crocodiles take people from canoes that have very little free board.

Conservation guidelines provided below have drawn from the wildlife policy and incorporated views and concerns of the Lower Shire riparian communities. The thrust of the guidelines is to minimise the human/wildlife conflict while at the same time raising peoples' living standards through sustainable utilisation of the wetland resources. The guidelines are applicable to both crocodiles and hippos.

- 1) Establish crocodile and hippopotamus population levels, trends and distribution through frequent counts, every two years.
- 2) Protect and enhance crocodile and hippo habitats through sustainable land-use practices along the riparian ecosystem such as catchment area conservation, soil and water conservation establishment of a vegetation strips between the river bank and field crops and sustainable water extraction practices.

¹ Revenue generated from the official sale of crocodile skins was US\$23,091 (200 skins at about \$115 each) in 1997; the figures for 1998 and 1999 respectively were \$7,170 (70 skins at \$102 each) and \$8,532 (100 skins at \$85 each) (Cold Storage, pers. com., 2000).

- 3) Operationalise the Lower Shire Natural Resources Co-management Committee (LSNRCC) newly formed by DNPW, strengthen existing Village Natural Resource Committees (VNRCs) and form some new ones where there are none at present in the riparian communities.
- 4) Develop guidelines and co-management plans for conservation of hippos and crocodiles with the participation of LSNRCC and VNRCs, WSM, Fisheries and other relevant Government Departments. The guidelines should clearly specify the rules and regulations of co-management, rights and responsibilities of communities with a mechanism put in place for benefit sharing.
- 5) Department of National Parks and Wildlife should acquire and upgrade sections of the marshes currently under customary land to protected public areas. These might include Elephant Marsh sections near Fatima Hospital on the east bank and Ntchenyera on the west bank and others, which are good crocodile, hippo and water fowl habitats. This will protect the areas from encroachment and enable them to attract international funding for the conservation and sustainable utilisation of the crocodiles, hippos and water fowls.
- 6) Improve eco-tourism where it exists and encourage communities to establish some where they do not exist. Assistance is required for construction of simple shelters for overnight visitors, acquisition of larger, stable boats and bird watching equipment.
- 7) Provide interventions that will reduce human/crocodile/hippo attacks such as sinking of wells, provision of big boats, irrigation and use of improved traditional safety measures such as “ntchinga”
- 8) Conduct aggressive and comprehensive awareness campaigns that will provide communities with a better understanding of environmental problems and promote concern and participation of individuals and groups of people in problem-solving processes. Community awareness and understanding of the origins of their conflict with crocodiles and hippos will result in changes in attitudes towards these animals. Changes in attitudes will eventually lead to observable changes in behaviour that will favour conservation and sustainable utilisation of the animals together with their habitats.
- 9) Where appropriate, community-based Trusts should be formed to look into the conservation and sustainable utilization of the natural resources with benefits accruing to communities.

6.0 ACTION PLAN

The strategy above outlines guidelines that will reduce human-wildlife conflicts (crocodiles and hippos). How these guidelines can be implemented and achieved is detailed in the field action plan below. An issue is first described to create a picture of the existing situation and then an Action Plan is provided.

6.1 Establishing Crocodile and Hippo Population Status, Levels and Trends

Issue

While, periodically, good crocodile and hippopotamus monitoring efforts have been made in the Lower Shire wetlands, there is no cyclical census in place that will yield a continuously updated assessment of the population levels and trends of these species. Results of a census done by the

Department of National Parks and Wildlife in 1997 agree with the communities' observation that crocodile population is increasing while that of hippopotamus is going down. It is necessary to establish with some degree of certainty the population levels and trends of both species. Based on population findings, Malawi may need to apply to CITES for an increase in the quota for the harvest of wild crocodiles.

Actions

- 1) Semi-annual crocodile counts should be conducted in the Lower Shire wetlands using methodologies established for December counts by the Department of National Parks and Wildlife.
- 2) Determine the population status, levels and trends of crocodiles and hippos through semi-annual counts paying special attention to population size, population structure, rates of survival, rates of reproduction and rates of immigration and migration.
- 3) Using information generated under (1) and (2) above, and in consideration with the carrying capacity as well as human/wildlife conflicts, an optimum crocodile and hippopotamus population for the Lower Shire needs to be determined.
- 4) An increase in the annual CITES quota for the overall Malawi harvest of wild crocodiles will be sought if determined to be appropriate relative to rationalised population levels in the Lower Shire and other parts of the country.
- 5) Decision on culling of crocodiles and sharing of benefits realised from sale of crocodile and hippo products (skins and meat) will be the right and responsibility of the communities. DNPW, WSM and Department of Fisheries will only provide guidance in conformity with international trade agreements.
- 6) Numbers of crocodile harvested and hippos killed in crop protection exercises will have to be carefully recorded by communities themselves (VNRCs).
- 7) Using information generated under (2) above, mount an aggressive campaign against poaching of hippo with a view of building up their population if determined to show a downward trend.
- 8) The initially established optimum populations in (3) above are to be reviewed at least every two years and population management efforts adjusted accordingly.
- 9) Establish liaison with Mozambique counterparts relative to crocodile and hippo management with emphasis on their immigration and emigration and transboundary areas where human-crocodile interactions are most severe.
- 10) Carry out studies on crocodile trade to establish the real monetary value that has to be communicated to the communities in an open and transparent manner.

6.2 Crocodile/Hippopotamus Habitat Management

Issue

Along with the rapidly growing human population in the Lower Shire coupled with their extensive settlement in the wetlands, is a significant reduction in crocodile and hippopotamus habitat. A single major causative agent for the destruction of wetland habitat in the Lower Shire is agriculture. Upland farmers cultivate their gardens without applying the necessary soil and water conservation measures. The result is siltation of the Shire River. Those cultivating in the wetlands drain the marshes, clear

the riparian vegetation and cultivate right down to the riverbanks. Vegetation that provides shelter and act as a source of food for small mammals, reptiles and birds found along the riverbanks and marshes is removed. The disappearance of the vegetation and the animals has created major food shortages for both crocodiles and hippos. In the absence of their natural food, hippos raid crops and crocodiles resort to taking human beings and their livestock.

Actions

- 1) Mount soil and water conservation campaigns advocating ridge alignment, agroforestry and reforestation projects in the whole of the Lower Shire catchment area. This will reduce soil loss, enhance agricultural production and improve breeding conditions that will help build up fish population.
- 2) Encourage farmers to establish 30 metre-wide buffer strips of natural vegetation between the riverbanks, marshes and crop fields. The buffer strips will provide forage for hippos and shelter for small mammals, insects and reptiles that are natural food for crocodiles. The strips will also minimize siltation of the riverbeds thus improving fish breeding conditions. Establishment of the strips is to be done with the consent, cooperation and full participation of the communities.
- 3) Establish nesting and grazing sanctuaries for crocodiles and hippos respectively. This should be done together with the communities and the support of Illovo where the sanctuaries happen to be in their estate (SUCOMA).
- 4) Build up fish populations in the Lower Shire through observation of community based rules and regulations on fishing. The rules and regulations include observation of off-season for fishing and use of only recommended gear. A build-up in fish populations will provide readily available food for crocodiles and reduce human crocodile conflicts. Beach Village Committees (BVCs) are to play a leading role in this issue with the guidance of Department of Fisheries.
- 5) Prevent unseasonal flooding of crocodile nesting grounds with water from hydroelectric dams on the River Shire. Water levels in the Shire River fluctuate daily with the unseasonal release of large volumes of water from Kapichira Dam. This poses a significant threat to crocodile nesting sites that may be flooded – disrupting both the laying and hatching of the eggs. The fluctuations are noticeable between Kapichira falls and Maseya. Electricity Supply Commission of Malawi (ESCOM) will be of great assistance on this issue, by implementing flood mitigation measures contained in their EIA report.
- 6) Establish live fences between the 30 metre-wide strip and the crop fields to prevent hippos from raiding crops. The fences will also permanently demarcate the strips as no cultivation zones.
- 7) Provide community based irrigation schemes away from marshes. These will reduce land pressure in the marshes. Reduced land pressure will help wetland vegetation to grow back in currently cultivated areas bringing back favourable environmental conditions for crocodiles and hippos. Chances of people coming in conflict with hippos and crocodiles while tending their crops will be reduced. Many communities are interested in irrigation. All they need is assistance with the pumps and start-up funds to run the pumps. After they are started it is their responsibility to maintain the operations. Most smallholder irrigation schemes are about four hectares and do not use pesticides and inorganic fertilizers. The establishment and operation does not warrant an impact assessment.

6.3 Co-management

Issue

Current perceptions in Lower Shire communities are quite negative relative to the value of hippos and crocodiles as well as efforts to control their impact on humans. Although significant numbers of crocodiles are culled from the area annually, traditional leaders and other area residents often state that very little is being done by government to address their problems. Some communities are requesting the elimination of crocodiles and hippos from the area entirely.

One of the reasons for a uniformly negative attitude toward crocodiles and hippos and conservation efforts aimed at protecting them is that communities presently enjoy no benefits from the culling activities. Harvesting of crocodiles which is carried out in the interests of communities is done by licensed hunters and communities do not benefit from the sale of the skins or meat. Consequently, crocodiles and hippos are seen solely as a menace and an infringement on community well being both in the sense of a risk to human life and as a reducer of profits from fishing and crop production respectively.

The Department of National Parks and Wildlife is moving in the direction of advocating and supporting the sustainable harvest of crocodiles with a component of the profits accruing to local communities. To this end, DNPW has formed a **Lower Shire Natural Resources Co-management Committee (LSNRCC)** comprising Lower Shire Traditional Authorities and Group Village Headmen from around Lengwe, Majete and Mwabvi protected areas. The Department also, has, at a lower level, **Village Natural Resource Management Committee (VNRCs)** which act as a link between DNPW and communities, help with supervision of natural resource collection in protected areas and participate in anti-poaching activities.

Actions

- 1) DNPW should finalise arrangements to make the newly formed Lower Shire Natural Resource Co-management Committee functional. The committee should include Traditional Authorities from wetlands that are, currently, not represented in the LSNRCC Committee. A meeting to round up logistics that will enable LSNRC to start functioning should be urgently convened.
- 2) Form new VNRCs and strengthen the already existing ones in riparian communities that will among other things focus their efforts on community-based conservation and sustainable utilisation of hippos and crocodiles.
- 3) Train LSNRCC and VNRC committee members on leadership skills. LSNRCC and VNRC Committee members should also be trained in simple financial management and be provided with basic wetland resources conservation skills.
- 4) Establish a sense of ownership and responsibility for natural resources among communities backed by clearly stated rules and regulations of co-management.
- 5) VNRCs are contact institutions on all co-management matters at community level.
- 6) Committee members representing the communities should participate in the formation of rules and regulations of co-management.
- 7) Committee members should have their rights and responsibilities clearly defined.
- 8) Committee members should be trained in effective conflict resolution among committee members themselves and between VNRCs and DNPW.

- 9) Train communities in simple hippo-crocodile management skills. The training be tailored to complement their indigenous knowledge on crocodile populations monitoring, habitat protection and harvesting of excess animals that may be determined necessary.
- 10) Mechanisms such as a Trust or a Cooperative should be put in place to ensure profits from crocodile/hippo management, for example, the sale of skins and meat², will be fairly shared with communities in return for their participation in conservation. Contact institutions at village level should be VNRCs. A Trust will be legally and socially accepted by the communities and registered. Members of Boards of Trustees and Governors will be elected from and by the communities. Where possible, even those who will be responsible for the day to day transaction of the Trust business should come from the community in question.

6.4 Human Crocodile/Hippo Attacks

Issue

Availability of natural food for hippos and crocodiles, particularly those that have reached an age or size where they are threat to humans, has been reduced with increasing use of the wetlands by Man and consequent reduction in normal crocodile prey. Crocodiles attack in a variety of situations when people are engaged in river transportation and fishing with small boats, fishing while standing in the water, tending crops and livestock on stream banks, bathing and collecting water. The Community Survey (2000) estimated that these attacks account for approximately 60 deaths a year and that more non-fatal encounters occur. Fatima Hospital alone claims to have treated 150 crocodile victims in the past five years (Rolf Schmidt, pers. com., 2000). By June (2000), Fatima Hospital had already treated about 20 victims this year. In a Survey conducted in eleven villages, Bhima and Jamusana (1998) put the mean number of people attacked at 2.6 per village per year. Some of these attacks can be avoided through slight behavioural modifications but, in many instances, unwise use of crocodile-infested waters continue to occur. Many myths and legends surround crocodiles. People believe that all problem crocodiles are created and manipulated by witches or magicians. Some witches put their crocodiles to good use such as fishing but others use them to injure or take humans and their livestock. Due to some mysterious influences, people who have been taken by crocodiles are known to have refused to take a bath at home and ignored their wives or family members' pieces of advice against going to the river. It is such circumstances that lead people to believe that some form of supernatural power forced their relative to go to the river where a crocodile was waiting to take them. Out of ignorance of crocodiles' stealthy behaviour, many community members in the Lower Shire believe that one can be taken by a crocodile simply getting hold of their shadow on the surface of the water.

People cultivating in the wetlands realise that they are encroaching on hippopotamus and crocodile territory and should take precautions to ensure safe passage when crossing to and from their gardens in canoes. Instead canoes are often overloaded resulting in very little clearance from the surface which creates opportunities for hungry crocodiles to attack. Hippos, especially those with young, have an easy time over turning these small canoes. People using fish dragnets are often seen partially submerged controlling their nets seemingly aware of, but disregarding, the risk of crocodile attacks to which they are subjecting themselves. Fishing with weighted ring nets that are cast from a standing position in a canoe done mostly at night is a very dangerous practice. Each time the net hits the surface, the splash can attract crocodiles. When the trapping method of fishing is used, people wading

² At present, the Department of National Parks & Wildlife issues hunting licenses directly to professional hunters. The possibility of devolving this function to local authorities or communities while maintaining control on culling rates, would allow local stakeholders to benefit from license revenues and perhaps also the sale of wildlife products.

up to their neck in the water set traps. Additionally women wash clothes at the water's edge, which creates a further risk of attacks.

A further complication is the fact that many Lower Shire residents believe that it is only supernatural crocodiles, rather than natural ones that attack humans.

Actions

- 1) Conduct awareness campaigns to change prevailing public negative attitudes towards crocodiles and hippos.
- 2) Conduct awareness campaigns where the emphasis will be placed on development an understanding of hippo and crocodile behaviour and on the discontinuation of unwise practices associated with the use of hippo-crocodile habitat.
- 3) Methods people used to protect themselves from crocodiles in the past such as use of ntchinga and mphinga should be revisited, improved and promoted where appropriate.
- 4) The use of larger boats that are not susceptible to hippo - crocodile attacks should be promoted. Here modest funding to assist communities buy soft wood planks would be necessary.
- 5) Support should be given to communities for the removal of aquatic weeds that provide hiding areas for crocodiles and increase chances of crocodiles attacking humans and livestock.
- 6) Particular attention should be paid to poverty and how it contributes to peoples' vulnerability to hippo and crocodile attacks. Efforts should be made to reduce such poverty through income generating activities (IGAs) that are conservation friendly. IGAs would include bee-keeping, guinea fowl raising and upland vegetable growing through irrigation.
- 7) Riparian communities should be provided with shallow wells. These will reduce their need to frequent the river or marshes for water where they can encounter crocodiles and hippos. Wells will also reduce waterborne diseases such as dysentery and diarrhea enabling community members to actively take part in conservation activities.
- 8) People carrying knives are known to have used them to rescue themselves. Community members should therefore be encouraged to always carry with them knives or a spears when going to River Shire and the marshes.

6.5 Human-Crocodile/Hippo Interactions Other than Direct Attack on Humans

Issue

As crocodiles mature, the component of their diet made up of fish declines and the proportion of mammals increases. Owing to the decline in both fish and wild mammal populations in the Lower Shire wetlands, crocodiles, apart from attacking humans, have habituated to other food sources such as goats, cattle and dogs. A licensed hunter has substantiated the general observation through examination of stomach contents of the larger crocodiles in 1998. While livestock losses are reported to be numerous, no statistics are available because incidents of this nature are commonly not reported. Despite this, almost all livestock belonging to residents of wetland communities are watered in the Shire River.

Fishermen suffer considerable destruction of equipment, particularly nets as a result of crocodile activity. As an illustration, in February 1998, fishermen at Mwala beach reported that their nets were being destroyed daily and that some were destroyed one day after purchase.

While the value of livestock and fishing nets lost to crocodiles has not been determined, given the subsistence nature of the local economy, and generally low levels of income, in the area it can be assumed that such losses constitute a significant impact on livestock owners and fishermen.

Actions

- 1) Install boreholes for the watering of cattle away from crocodile habitat. These could be same boreholes where people get their water but with an extended and enlarged drain to collect water for livestock watering.
- 2) Carry out sustainable harvest of crocodile populations with a view to decreasing damage to fishing equipment.

6.6 Eco-tourism

Issue

The Lower Shire still has patches of beautiful marsh. Large numbers of hippos, crocodiles and waterfowl are found in these areas. A few communities have, through their own initiative, established simple eco-tourism points. Visitors who frequent these areas are bird-watchers. Individuals make a bit of money from the visitors through services they lender as guides, porters and transporters. Problems of the industry, however, are lack of accommodation and reliable boats for moving through the marshes.

Actions

- 1) Upgrade potential eco-tourism areas to protected area status to prevent them from being destroyed through cultivation.
- 2) Provide training on community-based eco-tourism. DNPW to take a leading role.
- 3) Support communities' interested in eco-tourism with funding to procure boats, construct simple rest houses and acquire basic requirements for bird watchers. All these will be available to visitors on hire. Communities cannot afford to build these on their own.

6.7 Public Awareness and Information

Issue

The root cause for human-crocodile/hippo conflict is encroachment into their habitat. Natural food for both crocodiles and hippos is no longer there. They have disappeared with destruction of habitat. In searching for food, hippos graze on crops and crocodiles take humans or their livestock. Many people unfortunately believe that all crocodiles that take people are supernatural they are sent to attack people by witches or magicians.

There is need for an aggressive and extensive awareness campaign to make the public aware of the problems around them, their causes and possible solutions. The campaign should focus on crocodile - hippo safety and management.

Positive impacts of public awareness campaigns are demonstrated in a survey carried out by DNPW in which the old and the very young, who do not follow pieces of advice given during lectures/film shows, are the most common victims of crocodile attacks

Actions

- 1) Strengthen the Environmental Education Unit and WSM with training in extension and public speaking.
- 2) Provide necessary audio/visual equipment, such as screens, video cassette player, video camera and a generator.
- 3) Produce leaflets on behaviour of crocodiles and hippos and possible safety measures to be taken.
- 4) Conduct interactive lectures/meetings to elicit and discuss communities' views with the aim of changing their negative attitudes toward crocodiles and hippos to ones that are positive.
- 5) Use critical incidences such as crocodiles jumping for people in canoes and hippos trampling somebody to influence community members change their behaviour when in or near the river.
- 6) Use simple self-explanatory posters to illustrate crocodile/hippo safety precautions – for example, pictures on the dos and don'ts when using the Shire River and marshes.
- 7) Shoot local videos to show both good and bad behaviour that lead people to being safe or taken/injured by hippos and crocodiles while in the wetlands.
- 8) Use community based drama groups to dramatise a situation for discussion with communities with a view of changing their attitude towards conservation.
- 9) Use radio for quizzes, competitions, talks, interviews, jingles and drama to disseminate crocodile/hippo safety and management messages. The advantage with radio is that it reaches many people.
- 10) Use a project approach where communities themselves protect and rehabilitate wetland habitats. For example, establishment of buffer strips or hippo grazing sanctuaries. In parts of Lower Shire where buffer strips are established, farmers are already benefiting from increased crop yields as a result of reduced crop raiding.
- 11) Engage VNRCs and community members in some aspect of hippo/crocodile population monitoring. This will provide a good picture to communities on statues of hippo and crocodile populations.
- 12) Use traditional media (ceremonies, folklore) where ceremonies and folklore have links to environmental issues taking into account the history of the area and the perceptions and relationships of the people to their environment.

6. 8 Rapidly Increasing Human Population - Impacts

Issue

The human population of the Lower Shire wetlands has increased dramatically over the past several decades. Influxes of refugees and uncertainties on the survival of children have contributed to the

rapid population increase. Families have more than eight children thinking that if four die the other four will remain. In some cases all the eight survive. Well intentioned or not an extra individual means extra living space and extra land cleared for production of more food. This translates into more wetland cleared for cultivation and more human/wildlife conflicts.

Given a medical assurance that if they have four children under improved medical care the four will grow to adults, Lower Shire communities are likely to change their attitudes from big towards smaller families. Rapidly increasing population ranks very high in bringing about all kinds of environmental problems including human-crocodile/hippo conflicts.

Actions

- 1) The implementing agent together with COMPASS and other interested donors should liaison with Ministry of Health and Population on the establishment and location of drug Revolving Funds in riparian communities. Here volunteers chosen by communities will undergo a seven days training in diagnosis of simple illnesses and dispensation of drugs. After training the volunteers will be given essential drugs to get started. All patients coming for treatment will be required to contribute a nominal fee towards their treatment. Money realised from the contributions will be used to replenish the drugs.
- 2) Implementing agent to liaison with Ministry of Health and Population on the need to train Traditional Birth Attendants. These will be women forty years and above given training in safe motherhood. With training they will be able to advise women in the communities on what to do as expectant mothers and how to care for newborn babies. This will reduce both maternal and infant mortality that result from ignorance of basic medical care. In the long run, this will help reduce the rate of population increase in the wetlands.

7.0. ROLES AND REponsibilities

7.1 Wildlife Society of Malawi (WSM)

As an implementing agent WSM will have to:-

- 1) Source funds from donors for carrying out activities in the field work plans
- 2) Organise and facilitate community consultations to fine tune activities suggested in the field work plans
- 3) Facilitate active community participation in implementation of activities suggested in field action plans under the various issues described in the text.
- 4) Liaison with DNPW and other government departments that are to play leading roles in various situations.

7.2 Department of National Parks and Wildlife

- 1) Provide expertise in hippo/crocodile management.
- 2) Promulgation and enforcement of any legislation required to implement the plan – for example, co-management etc.

- 3) Liaison with institutions abroad for advice on crocodile/hippo conservation and utilization.

7.3. Ministry of Agriculture and Irrigation

- 1) Promote soil and water conservation to reduce both soil and for soil fertility loss as well as river siltation.
- 2) Promote food security among community members
- 3) Improve agricultural production on upland and reduce cultivation pressure from the wetlands.

7.4. Ministry of Health and Population

- 1) Improve health of community members through provisions of basic health services such as Drug Revolving Funds and training of Traditional Birth Attendants.

7.5 Coordination Unit for the Rehabilitation of the Environment (CURE)

- 1) The mandate for CURE will be to coordinate the participation of other NGOs engaged in field activities.

7.6 Department of Fisheries

- 1) Provide expertise in conservation of aquatic habitats.
- 2) Advise on activities geared towards building up of fish populations.
- 3) Advise on water hyacinth control.

7.7 HEARTH

- 1) Advise on water hyacinth control.

7.8 Chief Executives of Chikwawa and Nsanje

- 1) Help mobilize chiefs and their communities to take part in conservation activities.

8.0 CONCLUSION

Human/crocodile-hippo conflicts in the Lower Shire are a major problem. Newspapers and other forms of media have exaggerated matters but all the same the situation needs to be put under control as soon as possible.

Most conflicts occur when people go to work in their riverbank gardens, fish, bathe, wash clothes or fetch water while standing in the river or marshes. The situation will continue as long as these people continue to depend heavily for their livelihood on the River Shire and its accompanying marshes.

Modest and practical interventions such as provision of wells, plank boats and irrigation schemes contribute significantly towards reduction of human/crocodile hippo attacks. In Traditional Authority Maseya (Chikwawa) where IUCN – Lower Shire sub-project sank six shallow wells and provided two plank boats and an irrigation plot far from the river bank, frequency of attacks has been reduced by more than 60% in the past three years (IUCN quarterly report, 1999). The wells and irrigation

schemes reduced the number of people going down to river and thus reducing the frequency of attacks. If IUCN pilot activities in Maseya can be replicated in other riparian communities with severe crocodile/hippo attacks, the situation will greatly improve.

Crocodile/hippo safety campaigns are another important factor in reducing human/crocodile-hippo conflicts. If knowledgeable of the behaviour of hippos and crocodiles, people will be more careful when in the wetlands. They will not stand in the water thinking that crocodiles cannot attack them unless they are supernatural ones.

Lastly a mechanism should be put in place where villagers see crocodiles and hippos around them as assets and not liabilities. This can be done through co-management of the crocodiles and hippos where community members are allowed to share responsibilities and make decision over the conservation and sustainable utilization of the resources with profits accruing to them.

9.0 REFERENCES

- Bartlett; M-A.; Hickley; M.; Lennard; D.; Bartlett; R.; Pasteur; A.; Chiwona; E.; Munthali; H.; Chikuni; A.; Salubeni; A. & Ngonda; J.. 1991. The ecology and human geography of the Elephant Marsh: Lower Shire Valley, Malawi. The Cambridge Expedition to Malawi, July-August 1991: 135 pp.
- Bhima, R. and Jamusana, H. 1997. Hippo and crocodile counts in the Lower Shire River, unpublished crocodile count survey report. Department of National Parks & Wildlife, Lilongwe.
- Bhima, R. and Jamusana H. 1998. Hippo and crocodile counts in the Lower Shire. Unpublished survey report. Department of National Parks & Wildlife, Lilongwe.
- Bruessow, D. 1989. The reproductive capacity of the Elephant Marsh: Report on an aerial survey. Wildlife Africa Ltd., London.
- Chaweza, R.D. 1998. Expansionary effect of agricultural production and other detriments and deforestation to Malawi. Beijer Research Seminar, Zambia, May 1998.
- Chimatiro, S. and Mwale, B. 1998. Status of water hyacinth: Lower Shire. Paper presented to the IUCN Lower Shire Valley Sub-Project.
- Jamusana, H. (1994). Crop protection in the Lower Shire. Department of National Parks & Wildlife, Lilongwe.
- Mwafongo W.M.K. 1998. Diagnosis of farming systems in the Lower Shire wetlands, southern Malawi: Field Survey and Workshop Report.
- Readers Digest, 1962. Pretoria, South Africa.
- Shire Valley Agricultural Development Project, 1975. An atlas of the Lower Shire Valley, Malawi. Department of Surveys, Blantyre.
- Smith, B. *et al.* 1998. Economic value of the Zambezi Basin wetlands, Phase 1 Report.

ANNEX 1: LIST OF PEOPLE INTERVIEWED

L. D. Sefu	(Director) DNPW
Dr. R. Bhima	(Staff) “
H. Jamusana	(Staff) “
S. Chimatiro	(D. Director) Fisheries
C. A. Lipunga	(Staff) “
A. Maloya	(Staff) “
A. Kankoma	(Staff) “
W. Ali	(Staff) “
P. Samson	(Staff) “
S. Thom	(Staff) “
F. Fabiano	(Staff) “
T. Sawaya	(Staff) “
A. Jonaihan	(Staff) “
Dr. Rolf Schmidt	Doctor Fatima Hospital
Chimombo	Traditional Authority
Kasisi	(TA)
Mbenji	(TA)
Ng’abu (Chikwawa)	(TA)
Ng’abu (Nsanje)	(TA)
Tengani	(TA)
Chibuli	(G.V.H.)
Nyamula	(G.V.H.)
Mphamba	(G.V.H.)
Chikunkhu	Community member
Mwasalapa	“
F. Kachere	“
E. Elias	“
H. S. Maganga	“
E. Thauzeni	“
C. Fana	“
F. Tikondane	“
N. Kansokola	“
E. Willadi	“
J. Bible	“
N. Kanjoka	“
N. Mofat	“
N. Luka	“
P. Thauzeni	“
B. Chidoma	“
K. Fayitoni	“
Z. Thoundi	“
C. Malema	“
G. Njonje	“
Jumisalem	“

ANNEX 2: WORKSHOP PROCEEDINGS

A one-day Stakeholders Workshop was convened at Ryall's Hotel to review and discuss issues and suggestions contained in the draft report in an open and participatory forum with a view of developing an action plan that will minimise human/wildlife conflicts. Participants included Chief Executives of Chikwawa and Nsanje Districts selected Traditional Authorities from the Lower Shire where human/wildlife conflict is severe; Representatives from government and non-governmental organizations were also present.

COMPASS - an overview

Chief of Party, Dr. A. Watson welcomed everybody to the meeting and urged them to participate actively in discussions during the meetings. He went on and presented a brief overview of the COMPASS. Participants were told that COMPASS is a United States Agency for International Development (USAID) funded activity that started in April last year and will run for five years. It was also disclosed to those present that COMPASS is working to support community-based natural resource management in Malawi.

COMPASS Objectives

In line with the goal above, it was learnt that COMPASS objectives are:-

- To improve the management of natural resources in Malawi through community empowerment and awareness.
- To promote uses of natural resources that are environmentally sustainable and socially equitable.
- To support capacity building with community based groups and NGOs.

Targeted Results

Based on the clearly stated objectives above, the expected target results are as follows:-

- Building administrative capacity for CBNRM with NGO and Government.
- Ensuring efficient information exchange and liaison among all parties.
- Improved community mobilization skills.
- Supporting policy reforms and grassroots advocacy.
- Providing small grants.

Lessons Learned

COMPASS has learnt through experience that working with communities can be a lot more difficult than working with "sophisticated" NGOs. The Chief of Party noted, however, that working with communities is more rewarding because impact is direct and tangible. He went on to advise TAs and other participants that they should not sit back and wait for donors to come up with conservation initiatives in their communities but that they should lead in solving environmental problems that affect them.

Wildlife Management In The Lower Shire - A Slide Presentation By F. Kalowekamo

The COMPASS overview was followed by a slide presentation, which essentially summarized what is contained in this report. The presenter quickly went through the location, climate and land tenure system of the area as outlined in the survey report. Particular emphasis was paid to role marshes, the flood plain and upland play in the ecological and socio-economic of the area.

Economic Importance

The presentation paid special attention to value of wetlands - marshes and flood plain. The Lower Shire wetlands are ideal for animal husbandry such as goats and cattle that provide dietary protein and monetary income. Seventy percent (70%) of meat production in Malawi is from the Lower Shire.

With twelve (12) exploitable fish species, the Lower Shire ranks second in the importance for fisheries after Lake Malawi. Here again fish plays an important role in the provision of dietary protein and cash income. Participants were reminded that agricultural produce such as maize, sweet potatoes, tomatoes, vegetables and pumpkins consumed locally in the Lower Shire and in adjacent cities are all products of the wetlands. Wetlands are also sources of indigenous foods such as *nyika* that people fall back on in bad years. Forage and other natural resources such as mammals, reptiles, fish, birds and others are found in the wetlands. The most important wildlife assets of the Lower Shire are crocodiles and hippopotamus

Crocodiles and Hippopotamus

The generally warm temperatures, availability of water and forage that are ideal for the production of crops and livestock are also favourable for crocodiles and hippos. Participants were told that the river, riverbanks and the marshes are crocodile and hippo territories. Riverbank cultivation and other activities in these areas amount to encroachment that leads to human/wildlife conflict. What is important now is to find ways to coexist.

Behaviour Leading to Human/Animal Conflict

Those present were shown that the use of canoes with little freeboard, bathing in the river, fishing while standing in the river and river bank cultivation were among other activities that lead to human/wildlife conflicts.

Possible solutions to conflict such as the use of larger, more stable boats, *ntchinga* and provision of wells were cited. Habitat management, culling undertaken after establishing accurate population data using scientifically rigorous surveys, co-management with clear and tangible benefits to stakeholders and public awareness and education are among other crucial solutions to the problems.

Conclusion

The presentation concluded by having participants to note that:-

- Human-animal conflicts in the Lower Shire are becoming worse as economic use of the wetlands increases;
- Long-term socio-economic well-being requires maintaining ecological health;
- There is no simple remedy: an integrated approach is essential; and
- Co-management of natural resources appears the most promising approach.

Participants were given time, after the presentation, to ask questions and discuss the presentation.

Discussion and Action Planning in Small Groups

Four groups were formed among the participants. Each group was assigned a topic as follows:-

- Group 1: Land Use Planning and Management
- Group 2: Education and Awareness Strategy

- Group 3: Co-management of natural resources
- Group 4: Practical methods for reducing human-wildlife conflicts.

Plenary Session

Group 1: Land Use Planning and Management

The group came up with a number of environmental factors that require consideration in order to come up with a reasonable land use and management plan. The factors are as listed below:

- Erratic and little rainfall;
- Declining soil fertility - more so in the uplands;
- Monocropping;
- Riverbank cultivation; and
- Overgrazing and uncontrolled grazing.

Possible solutions to these environmental problems include:

- Soil and water conservation;
- Reforestation of deforested areas;
- Establishing grazing catchments (rotational grazing); and
- Controlling bush fires

Diversify agricultural activity programmes to include:

- Fish farming;
- Stall farming;
- Small stock;
- Irrigation; and
- Dairying

Encourage soil fertility maintenance programmes such as:-

- agroforestry
- manure making and use

Encourage agro-based income generating projects such as oil extraction.

Group 1 Workplan

Activity	Period	Lead person
• Form and strengthen CBNRM Committee	Sept. – Oct 2000	DFO
• Brief committee leaders	Oct 2000	DFO
• Formulate by laws	Oct-Nov 2000	TA
• Identify and develop communal grazing catchments	Nov 2000	TA
• Brief DEC and DA members	Sept. 2000	CE
• Form clubs on fish farming, stall feeding, irrigation and dairying		PJO
• Construct contour marker ridges		PJO
• Make compost manure		PJO
• Re-align ridges		PJO
• Establish agroforestry nurseries		PJO

Group 2: Education and Awareness Strategy

In its strategic planning for public awareness campaigns, Group Two suggested the following:

- Radio and newspapers should be used to generate awareness among the public;
- Communities should organise themselves and form community-based drama groups;
- Teachers and parents should play an active role in informing and persuading people of the need to conserve natural resources; and
- Politicians should play a positive role by informing people about the need for conservation of natural resources.

The group went on to suggest and present conservation rules and regulations that community members need to be taught or reminded of. They included:

- The need to educate fishermen on the negative impact of indiscriminate catching of fish;
- The need to educate and persuade fishermen to establish and observe closed fishing seasons to allow the fish to breed;
- The establishment of irrigation schemes away from the riverbanks that will contribute toward reducing the number of people being taken or injured by crocodile or hippos;
- Building awareness and understand the role each organisation plays in maintaining a balanced and functional ecosystem;
- Community members to be encouraged to develop a spirit of ownership for the natural resources around them and internalise the need to conserve; and
- Communities should be told the ecological and economic importance of crocodiles and be provided with safety skills that will facilitate the human/crocodile co-existence. Tips on crocodile safety measures include:
 - people not going to bathe in the Shire River;
 - stopping river bank cultivation;
 - reducing animal numbers if warranted based on rigorous, scientific census data;
 - discouraging people from believing on supernatural crocodiles and protection from traditional healers.

Group 3: Co-management of Natural Resources

The group singled out lack of dependable scientific data of crocodile and hippo populations and scarcity of forage for hippos and food for crocodiles as major constraints on natural resource management in the Lower Shire. To address issues above, the group came up with action plan as outlined below.

Activity	Responsibility	Time frame
The committee will be chiefs, Civil Service representatives, NGOs and community members	Traditional authorities Fisheries Chief Executives	After next DDC meeting
The Committee will be chiefs, Civil Service representatives, NGOs and community members	Traditional authorities Fisheries Chief Executives	After next DDC meeting

Group 4: Practical Methods for Reducing Human/Wildlife Conflict

The group listed a number of activities that need to be undertaken to reduce human-wildlife conflict.

The activities are outlined below:

- Crocodile and hippo populations should be established through credible scientific methods.
- While waiting for scientific census of the crocodiles and hippos, a small number of crocodiles should be culled in areas where there is a conflict such as at Kapichira and Marka.
- The Government is requested to understand the magnitude of the problem and sympathize with the Lower Shire communities.
- Destructive fishing methods such as use of *kokota* and *masikito* should be banned. A mesh size of 2.5" is recommended for *chavi* and *ukonde*. *Miono* should have spaces big enough to allow small, immature fish to escape.
- Establish and encourage fish farming in Lower Shire.
- Ways should be identified that will motivate communities to participate actively in manual removal of water hyacinth. Possible methods include removal and use of water hyacinth for making briquettes, mats and mosquito coils that can be sold to generate income for community members.
- Traditional crocodile safety methods such as constructions of *nthenga* should be promoted and constructed where people draw water and in livestock watering points.
- A mechanism should be put in place that will allow local communities to acquire larger and more stable boats for crossing the river and fishing.
- Riparian communities should be reminded about the need and advantages of cultivating away from the riverbanks.
- Lower Shire communities should be encouraged to plant trees in their gardens to arrest run off and soil loss.

Conclusion

In conclusion of its presentation the group emphasized the fact that human/wildlife conflict in the Lower Shire can only come to an end through cooperation and collaboration among the stakeholders.

Recommendations

Drawing from what transpired from presentations, questions and discussion and the plenary session, participants recommended that:

1. Traditional Authorities should, as soon as they get home, convene awareness meetings on crocodile and hippopotamus safety measures.
2. There is a need to introduce and enforce a closed fishing season in the Lower Shire to enable fish to breed.
3. Fishing nets with recommended mesh sizes 2.5" or above should be allowed while drag nets and nets with mesh sizes of smaller than 2.5" should be banned.
4. Ways that will enable communities acquire larger and more stable boats should be explored and made known to communities.
5. A way to provide wells to riparian communities should be identified.
6. Upland/flood plain irrigation and fish farming should be encouraged.
7. Seed multiplication programmes should be established as well as creation of loan opportunities for small business ventures.
8. Agro-forestry technologies for enriching the soil should be promoted widely in the Lower Shire
9. Networking on conservation information should be encouraged among stakeholders at all levels from government to the grassroots.
10. There should be carefully controlled crocodile culling to minimise the human/crocodile conflicts.
11. The newly formed Lower Shire committee on co-management should start operating as soon as possible.

List of Participants

Chief Mbenje	Nsanje
Chief Chimombo	Nsanje
Chief Ngabu	Nsanje
Chief Ngabu	Nsanje
Chief Nyachikaza	Nsanje
Chief Kasisi	Chikwawa
Chief Tengani	Nsanje
G.V.H. Chibulu	Nsanje
G.V.H. Mphamba	Chikwawa
G.V.H. Mphampha	Nsanje
G.D. Mnembo	Officer-in-Charge, Chikwawa Police
P.B. Siliya	Nsanje Assembly
K.D. Dakamau	Chief Executive, Chikwawa Assembly
B.H. Komakoma	PJO Chikwawa
T. Shaba	CURE
D. Takomana	HEARTH
D.D.C. Mauambeta	WSM
K. Hassen	Private hunter
R. Hartley	DNPW
Ms. Pat Whitbread	SUCOMA
Felix Kalowekamo	COMPASS Consultant
Andrew Watson	COMPASS
Anax Umphawi	COMPASS
Mesheck Kalpila	COMPASS

ANNEX 3: COMPASS Publications

Document Number	Title	Author(s)	Date
Document 1	Work Plan: 1999	COMPASS	Jul-99
Document 2	COMPASS Small Grants Management Manual	Umphawi, A., Clausen, R., Watson, A.	Sep-99
Document 3	Work Plan: 2000	COMPASS	Dec-99
Document 4	July 1-September 30, 1999: Quarterly Report	COMPASS	Oct-99
Document 5	Training Needs Assessment: Responsive Modules & Training Approach	Mwakanema, G.	Nov-99
Document 6	Guidelines and Tools for Community-Based Monitoring	Svensden, D.	Nov-99
Document 7	Policy Framework for CBNRM in Malawi: A Review of Laws, Policies and Practices	Trick, P.	Dec-99
Document 8	Performance Monitoring for COMPASS and for CBNRM in Malawi	Zador, M.	Feb-00
Document 9	October 1 - December 31, 1999: Quarterly Report	COMPASS	Jan-00
Document 10	Workshop on Principles and Approaches for CBNRM in Malawi: An Assessment of Needs for Effective Implementation of CBNRM	Watson, A.	Mar-00
Document 11	January 1st - March 31st, 2000: Quarterly Report	COMPASS	Apr-00
Document 12	Thandizo la Ndalama za Kasamalidwe ka Zachilengedwe (Small Grants Manual in Chichewa)	Mphaka, P.	Apr-00
Document 13	Njira Zomwe Gulu Lingatsate Powunikira Limodzi Momwe Ntchito Ikuyendera (Guidelines and Tools for Community-based Monitoring in Chichewa)	Svensden, D. - Translated by Mphaka, P. and Umphawi, A.	May-00
Document 14	Grass-roots Advocacy for Policy Reform: The institutional Mechanisms, Sectoral Issues and Key Agenda Items	Lowore, J. and Wilson, J.	Jun-00
Document 15	A Strategic Framework for CBNRM Media Campaigns in Malawi	Sneed, T.	Jul-00
Document 16	Training Activities for Community-based Monitoring	Svensden, D.	Jul-00
Document 17	April 1st - June 30th, 2000: Quarterly Report	COMPASS	Jul-00
Document 18	Crocodile and Hippopotamus Management in the Lower Shire	Kaloweckamo, F.	Sep-00

Document 19	Cost-Sharing Principles and Guidelines for CBNRM Activities	Moyo, N.	Aug-00
Document 20	Work Plan: 2001	COMPASS	Oct-00
Document 21	July 1st - September 30th, 2000: Quarterly Report	COMPASS	Jul-00
Internal Report 1	Building GIS Capabilities for the COMPASS Information System	Craven, D.	Nov-99
Internal Report 2	Reference Catalogue	COMPASS	Feb-00
Internal Report 3	Workshop on Strategic Planning for the Wildlife Society of Malawi	Quinlan, K.	Apr-00
Internal Report 4	Directory of CBNRM Organizations	COMPASS	Jun-00
Internal Report 5	Proceedings of Water Hyacinth Workshop for Mthunzi wa Malawi	Kapila, M. (editor)	Jun-00
Internal Report 6	COMPASS Grantee Performance Report	Umphawi, A.	Jun-00
Internal Report 7	Examples of CBNRM Best-Practices in Malawi	Moyo, N. and Epulani, F.	Jul-00