



Summary Report of Mpingo Survey 2000

Mpingo Survey 2000, the fourth expedition from the Mpingo Conservation Project, conducted two months of field investigations across Lindi Region in south-eastern Tanzania. Previous expeditions in 1996 and 1998 deliberately selected mpingo rich habitats to survey. The bias inherent in this selection of study site made extrapolation of the results to a wider area difficult. The *Mpingo Survey 2000* expedition attempted to address this problem by surveying nearly 1,000km² in 6 separate sites across Lindi Region, each randomly located.

The whole region, excluding the Selous Game Reserve, was divided into 3 strata according to distance from the Indian Ocean, and two study sites randomly generated in each strata. Precautions were taken to avoid overlapping study sites or situating sites on around towns. Conversely sites which were too far from a town with a hospital and air-strip were rejected for safety reasons. The study sites ranged from degraded coastal forest at Mkanga on the Rondo plateau through secondary thicket at Mkoka and classic miombo woodland at Kilimarondo. Table 1 lists the six study sites surveyed and their respective locations by strata.

Strata (distance from coast)	Name of Nearest Village	Centre of Site
1 : 20km-100km	Mkanga	10° 12.5' S 39° 16.6' E
...	Nangaro	09° 53.8' S 39° 25.8' E
2 : 100km-180km	Kimambi	09° 24.6' S 38° 27.8' E
...	Mkoka	10° 10.6' S 38° 44.0' E
3 : 180km-260km	Barikiwa	09° 30.5' S 37° 54.1' E
...	Kilimarondo	10° 33.1' S 38° 03.2' E

Table 1. Location of study sites.

Surveying methods followed closely that of previous expeditions, and particularly that developed by the *Tanzanian Mpingo 98* team. At each site between 34 and 43 randomly located plots were surveyed, each of 20m radius. Each plot was categorised as either being riverine, i.e. containing a seasonal water course (which took priority), burnt (since the start of the dry season) or unburned, and the percentage tree canopy cover was estimated for each plot along with canopy and grass height.

Within each plot all adult mpingo trees (having at least one stem with CBH \geq 10cm) were identified and the following measurements taken:

- Circumference at Breast Height (CBH) of each stem with CBH \geq 10cm
- Estimated Straight Length (ESL) of each such stem
- Basal circumference
- Tree height (measured by use of a clinometer)
- Canopy area

Subjective indices for termite infestation and fire scorching on each adult mpingo were also noted as per previous expeditions. Juveniles were surveyed by use of a sub-plot centred on the nearest mpingo seedling or sapling to the centre of the plot, or around the nearest juvenile of any species if young mpingo is absent. All mpingo and other seedlings and saplings were counted in a 2m radius, and canopy cover of different tree and shrub species estimated in a 5m radius.

In contrast to the previous expeditions, *Mpingo Survey 2000* found very few mpingo, and none at all in two study sites, Mkanga and Nangaro, in strata 1. Adult mpingo trees were found in 10% of plots at an overall density of 1.36 trees per hectare, though slightly more frequently (14.7% of plots) in plots where

canopy cover was between 26% and 75%, and which reflects mpingo's designation as a woodland species. Other habitat characteristics were not found to have a significant effect on the presence or absence of mpingo. Table 2 below summarises these results by site and plot type.

Study Site	Unburned	Burnt	Riverine	Overall Mean
2 : Kimambi	6%	0%	21%	10%
2 : Mkoka	9%	56%	–	19%
Strata 2 Overall	8%	25%	21%	14%
3 : Barikiwa	6%	25%	30%	18%
3 : Kilimarondo	16%	7%	22%	14%
Strata 3 Overall	11%	13%	26%	16%
All study sites	6%	13%	16%	10%

Table 2. Frequency (%) of encountering adult mpingo in survey plots by plot type and study site.

Mpingo juveniles were noted in 19% of plots, and were totally absent from the same two study sites from which adult specimens were absent. Table 3 below is the equivalent of Table 2 for juvenile presence in plots. The greater frequency of juveniles than of adults is healthier than the reverse situation which prevailed at Migeregere when surveyed by the *Tanzanian Mpingo 98* expedition. In the four sites where they were present, mpingo of any age occurred at a frequency of 36%. Mpingo juvenile presence in a sample plot showed no relationship with the presence of adult mpingo in the plot.

Study Site	Unburned	Burnt	Riverine	Overall Mean
2 : Kimambi	0%	0%	15%	6%
2 : Mkoka	42%	0%	–	33%
Strata 2 Overall	31%	0%	15%	22%
3 : Barikiwa	20%	14%	60%	33%
3 : Kilimarondo	24%	57%	25%	36%
Strata 3 Overall	22%	43%	44%	35%
All study sites	19%	16%	22%	19%

Table 3. Frequency (%) of encountering juvenile mpingo in survey plots by plot type and study site.

The frequency of juvenile mpingo was not found to increase when local canopy cover (within a 5m radius) was less than 40% as had been found by the *Tanzanian Mpingo 98* expedition. However estimated canopy height for the whole sample plot was found to be a significant factor in mpingo juvenile presence, with the likelihood of encountering mpingo juveniles almost doubling from 23% to 43% in plots where the estimated canopy height was 6m or less in the four study sites where any mpingo at all were found.

The mpingo surveyed were more likely (41% of adult mpingo) to have multiple stems than those observed by the *Tanzanian Mpingo 98* expedition in the mpingo rich habitat at Migeregere (23% of mpingo), perhaps a reaction to growing in less suitable conditions. However in this case the presence of multiple stems is not correlated with recent burning.

By examining the relationship between CBH of the largest stem and basal circumference the expedition was able to derive a simple model to allow estimation of CBH from stumps, although it needs further refinement from a data set containing more large trees. The model, which explains 85% of the variation

in this data set, is $CBH = 0.737 \times BC$, however it's accuracy is doubted for trees with a basal circumference in excess of 1.4m.

The size structure of adult mpingo showed a distribution highly skewed towards smaller, pole-size trees, which accounted for 74% of adult mpingo recorded. Table 4 shows the variation in tree size by plot type.

Max CBH (cm)	Unburned	Burnt	Riverine	All plots
Mean	22	40	22	28
Standard error	8	41	9	25
Max	35	127	46	127

Table 4. Comparative thickness by plot type of stem size of adult mpingo to the nearest cm.

The expedition followed the practice of *Tanzanian Mpingo 98* in estimating the straight length of trunk for each adult mpingo, and found that 54% of trees had a sufficiently straight bole or bole-section that they might potentially be harvestable at some point now or in the future, but only 6% of trees also had a girth sufficient to justify harvesting now. Total harvestable worth of mpingo found in the survey amounted to a negligible $0.0075\text{m}^3\text{ha}^{-1}$.

Calculations based on this figure have refined the stocks estimations of previous expeditions, roughly halving the maximum estimate. However further research on harvesting practices, the effects of fire and heart-rot, and variation in timber colour is needed to produce a more precise, usable estimate. For the present, and following the consensus of local experts which triggered the mounting of the expedition, we conclude that current harvesting is unlikely to be or remain sustainable in the long term when infrastructure improvements facilitate cheaper logging on a large-scale throughout the region. Management of mpingo should thus be based on the precautionary principle until more detailed information is available.

The Team

Hassan Chinole
Wendy Foden
Jon Goh
Al Greer
Moirra Herring
Jess Hrivnak
Canisius Kayombo
Dan Lashley
Abdon Mapunda

Frank Mawi
Daniel Minja
Musa Mpandula
Iddi Mwanyoka
John Ndonde
Keri Page
Jeremy Pickles
Ben Please
Anthony Sangeda

Fortunate Senya
Kinyemi Sepeku
Riziki Shemdoe
Maria Sheridan
Raechel Slattery
Ewan Wallis
Phil Whitby

Game Scouts: Patrick Matthew, Abdullah Mandale, Hassani, Mtila, Simba, Habibu, Mewile, Said Ngabyela, Chande Ligeni, Abdalah Njambe, Mussa Omari

Drivers: Paskal Ngonyani, Ibrahim 'Durban', Hasani Saidi

Project Coordinator: Steve Ball