Mashare - Woody Vegetation

The vegetation at the Mashare study site shows a distinct difference between the tree communities of the Kavango River valley and those of the sand plain. Very little is left of the natural vegetation on the riverbank and the alluvial terrace on the Namibian site as most human activities in the area are centred along the Kavango River. The remaining woody vegetation is characterized by two tree communities: the *Acacia nigrescens - Peltophorum africanum* community, referred to as Kavango riverine vegetation, and the *Acacia erubescens - A. luederitzii* community, referred to as thornbush vegetation. Kavango riverine vegetation has a very dense tree layer with trees up to about 22 m high, much higher than the trees of the woodlands. The thornbush vegetation has a short tree layer and occurs in areas with high anthropogenic impact.

Woodlands further away from the river are mainly used for extensive grazing, hunting and harvesting of firewood, poles and fruits. Large areas burn annually because locals use fire to increase grazing and facilitate hunting. Commercial timber harvesting only started during the South African mandate period, in the 1950s, and focuses on Kiaat (*Pterocarpus angolensis*). Very few harvesting permits are currently being issued although there is some illegal logging taking place. Permanent settlement and agriculture is limited to the areas close to non-perennial riverbeds (omiramba or nomuramba - in Otjiherero, respectively, one of the Kavango languages) that have slightly better soils and where most of the boreholes are situated. The *Acacia erioloba - Philenoptera nelsii* community can be found near the banks of the omiramba. This riverbed vegetation is characterised by short trees, a dense grass and shrub layer with *Croton gratissimus* as another indicator tree species. It is the only community in the woodland area that appears to be influenced by soil composition, as all other tree communities occur on deep, nutrient poor Arenosols.

Differences between tree communities in the remaining woodland areas are small. The usage of the presence/absence of a species in circle 1 of the plots allows a distinction of the *Baikiaea plurijuga - Schinziophyton rautanenii* community, *Terminalia sericea* community, *Combretum psidioides* community, *Burkea africana* community and *Pterocarpus angolensis* community. The main factors influencing the occurrence of these woodland communities appear to be the source and degree of disturbances, and to a lesser extent local differences in heights and aspects. The *Baikiaea–Schinziophyton* community has a denser tree layer with about 30% coverage and is also characterized by the presence of *Commiphora* species. It often occurs on north facing slopes of dunes and is found further away from riverbeds (> 3 km). The *Terminalia sericea* community is closer to the Kavango River (< 7 km) and main road (< 4 km) than the other communities and affected by cattle moving through on their way to the river. It is characterized by a dense shrub layer with pioneer *Terminalia*

Table 1: Woody vegetation: plot design and key figures.

Ecoregion
Zambezian *Baikiaea* woodlands
Sampling period
2011-2013
Plots consist of three concentric circles
1) radius 10 m: trees with diameter at breast height (dbh) > 5 cm (314 m^2) 2) radius 20 m: trees with dbh > 20 cm (1,257 m^2) 3) radius 30 m: trees with dbh > 45 cm (2,827 m^2)
Number of living trees measured
570 of which 389 in circle 1
Number of tree species in circle 1
35; 28 after removing species occurring only in one plot
Most common trees in circle 1
Terminalia sericea (58), *Burkea africana* (36), *Baikiaea plurijuga* (34)
Species with largest total basal area in circle 1
Schinziophyton rautanenii (30,057 m^2), *Guibourtia coleosperma* (13,606 m^2), *Pterocarpus angolensis* (9,052 m^2)

Fig. 1: *Pterocarpus angolensis* looses its leaves in the dry season (June 2011) (photo: V. De Cauwer).

Fig. 2: Large *Pterocarpus angolensis* at the end of the rainy season (April 2011) (photo: V. De Cauwer).

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Fig. 3: *Manketti (Schinziophyton rautanenii)* on the alluvial terrace. The species is much less harvested than other tree species because of its fruits (June 2011) (photo: V. De Cauwer).

sericea as indicator species and only rarely contains *Pterocarpus angolensis*, hence can be referred to as secondary vegetation. The *Combretum psidioides* community has a very open tree layer (about 15%), a denser grass layer and is closer situated to settlements and boreholes (< 5 km) than the other woodland communities. The *Burkea africana* and the *Pterocarpus angolensis* community are very similar: both are found further away from the Kavango River, boreholes and settlements, often contain *Pterocarpus angolensis* and have a tree canopy coverage of about 20%. Tree diameters are, however, smaller for the *Burkea africana* community and fire damage is more severe.

Table 2: Tree communities of the Mashare study site with indication of the most important species within circle 1 ($p < 0.2$) and an overview of tree inventory data. IV is the indicator value, with 100% representing a perfect indication, and *p*-values are calculated from a Monte Carlo permutation test. The values DBH_{max} and H_{max} reflect the average maximum diameter at breast height and the average maximum tree height per plot (all 3 circles).

Tree communities	IV	*p*	Number of plots	DBH_{max} [cm]	H_{max} [m]
Community 1: *Acacia nigrescens - Peltophorum africanum*			**2**	**66**	**20**
Acacia nigrescens	100	0.004			
Peltophorum africanum	100	0.004			
Ziziphus mucronata	33	0.199			
Community 2: *Acacia erubescens - A. luederitzii*			**4**	**35**	**9**
Acacia erubescens	75	0.005			
A. luederitzii	50	0.021			
Community 3: *Acacia erioloba - Philenoptera nelsii*			**3**	**44**	**9**
Acacia erioloba	92	0.000			
Philenoptera nelsii	67	0.006			
Croton gratissimus	40	0.038			
Community 4: *Baikiaea plurijuga - Schinziophyton rautanenii*			**4**	**85**	**13**
Commiphora spp.	73	0.000			
Baikiaea plurijuga	61	0.002			
Schinziophyton rautanenii	54	0.036			
Community 5: *Terminalia sericea*			**5**	**56**	**12**
Terminalia sericea	32	0.000			
Community 6: *Combretum psidioides*			**12**	**49**	**11**
Combretum psidioides	62	0.000			
Community 7: *Burkea africana*			**8**	**50**	**13**
Burkea africana	71	0.000			
Community 8: *Pterocarpus angolensis*			**2**	**62**	**14**
Pterocarpus angolensis	48	0.016			
Dialium engleranum	40	0.130			

Fig. 4: Directorate of Forestry staff collecting research material in the state forest at Hamoye Forestry Research Station (October 2012) (photo: V. De Cauwer).

Fig. 5: *Pterocarpus angolensis* in a patch of woodland that was recently burned (October 2012) (photo: V. De Cauwer).

Fig. 6: Cattle being driven along a forest road (April 2011) (photo: V. De Cauwer).

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