Research Application Summary

Fire regime characterisation and mapping in the Niassa National Reserve: Preliminary results

Aménio Cangela & Natasha Ribeiro
Faculty of Agronomy and Forestry, Campus Universitario, Building # 1, P. O. Box 257, Maputo, Mozambique
Corresponding author: armeniocangela@gmail.com; joluci2000@yahoo.com

Abstract

Niassa National Reserve (NNR) located in northern Mozambique is the largest conservation area in the country. It is subjected to fires every year due to agricultural and forestry activities. This study aims to map and characterise the fire regime in the Niassa National Reserve during 2000 to 2012 in order to contribute towards establishing an effective fire management programme. Preliminary results show that the Central, North and Northwest of the Niassa National Reserve are burnt more frequently than other areas in the reserve.

Key words: Fire regimes, National Reserve, Niassa, wildfire

Résumé

La Réserve Nationale de Niassa (NNR) située dans le nord du Mozambique est le plus grand domaine de conservation dans le pays. Il est soumis à des incendies chaque année suite aux activités agricoles et forestières. Cette étude vise à cartographier et à caractériser le régime des incendies dans la Réserve Nationale de Niassa au cours de la période allant de 2000 à 2012 afin de contribuer à l'établissement d'un programme efficace de gestion des incendies. Les résultats préliminaires montrent que les parties du Centre, du Nord et du Nord-Ouest de la Réserve Nationale de Niassa sont incendiées plus fréquemment que le reste de la réserve.

Mots clés: Régimes d'incendies, Réserve Nationale, Niassa, Feu de forêt

Background

Uncontrolled fires in Mozambique have become more frequent and are threatening the integrity and biological diversity of most ecosystems. Conservation areas in the country have not been spared by these fires as they burn every year compromising their conservation objectives. The Niassa National Reserve (NNR), in northern Mozambique measures 42,000 km^2 and is the the largest conservation area in Mozambique. This study aims to map and characterise the fire regime in the NNR, in

the period 2000 - 2012. This is a follow-up of the study carried out by Ribeiro *et al.* (2008). It seeks to enlarge the knowledge base for effective fire management and to supply information relevant for the evaluation of fire effects on the availability of forest resources to local communities.

Literature Summary

Between 2001 to 2005, about 13% of the NNR was burnt annually, 25% at least 3 to 4 times, 20% at least 2 times in (Ribeiro *et al*., 2008). Their study also revealed that the frequency of fires in this area is higher in the north-central and eastern parts of the reserve.

Fire has a fundamental role in the ecology of the miombo ecosystems, the major ecosystem in the reserve. The frequency and fire seasonality influence the abundance and the distribution of plant species in the savanna ecosystems (Delarze *et al*., 1992; Holdo, 2007; Trapnell, 1959). On the other hand, modification of land use and cover can change fire regimes, increasing fire frequency that negatively affect the tolerance of the species to fire. This may modify the pattern of spatial distribution and, in some cases, threaten some less tolerant species (Beaty and Taylor, 2001; Glover, 1968; Trapnell, 1959).

Study Description

Niassa National Reserve is located in North of Mozambique;70% of which is covered by the miombo woodlands while the remaining 30% is covered by open savannas and dambos. The climate in north Mozambique is tropical humid with annual medium precipitation ranging from 600 to 1400mm.

For the characterisation of the fire regime we used satellite images from the MODIS sensor. This study used the MODIS active fires (MOD14 and MYD14) and burned areas (MCD45A1) products. From active fires, the study used pixels with confidence level 8 and 9. The active fire pixels were matched with burned areas pixels using the Julian's day. To characterise the fire regime, fire frequency, fire return interval, density, intensity, extension and seasonality were analysed.

In the next step the study analysed the association between land cover, climate (precipitation) and human settlement and the fire regime parameters. Landsat images were used for land cover classification. Logistic regression analysis and Pearson Correlation were applied to find which factors influenced the variation of the fire regime.

To validate the results of the fire regime map produced from satellite images, field data were collected with the local communities' involvement. Field data collection involved visits to existing permanent plots, where information on fire frequency, fire damages on the vegetation and weather conditions was obtained.

Preliminary Results

The preliminary analyses indicated that between 2000 and 2010, the Central, North and NorthEast of the NNR had the highest occurrence of fires. The fire frequencies in these areas ranged from 3-4 burns.

Acknowledgement

This project was supported by funding from RUFORUM under the Graduate Research Grants. Special thanks are extended to all team members involved in the field work.

References

Beaty, R.M. and Taylor, A.H. 2001. Spatial and temporal variation of fire regimes in a mixed conifer forest landscape, Southern Cascades, California. *Journal of Biogeography* 28:955-966.

Delarze, R., Caldelari, D. and Hainard, P. 1992. Effects of fire on forest dynamics in Southern Switzerland. *Journal of Vegetation Science* 3:55-60.

Glover P.E. 1968. The role of fire and other influences on the savannah habitat, with suggestions for further research. *African Journal of Ecology* 6 1:131-137.

Holdo, R.M. 2007. Elephants, fire and frost can determine community structure and composition. *Ecological Applications* 17:558-568.

Ribeiro, N.S., Shugart, H.H., Swap, R.J. and Okin, G.S. 2008. Five-year period of fire regime in the Miombo Woodlands of Niassa Reserve, Mozambique in northern Mozambique. PhD Thesis. University of Virginia, Charlottesville.

Trapnell, C.G. 1959. Ecological results of woodland and burning experiments in Northern Rhodesia. *The Journal of Ecology* 47:129-168.