Title: The demographic response of grass species to fire treatments in a Guinean savanna

Supplementary Materials

Tables

Table S1: Value of the Keyfitz metric (Δ) showing the distances between the observed and predicted size-class distribution for all species under each fire treatment.

Species	Early fire	Mid-season fire	Late fire	No-fire
Andropogon canaliculatus	0.06	0.205	0.025	0.07
Andropogon schirensis	0.105	0.11	0.145	0.12
Hyparrhenia diplandra	0.035	0.08	0.065	0.065
Loudetia simplex	0.135	0.23	0.125	-

Table S2: Age-based parameters of the average matrix model for the four grass species under each fire treatment. Values are mean ± standard deviation and the mean of the five size-classes (Mean). y_i = mean age in each size-class under the hypothesis of stable size distribution, S_i = mean age of residence in the i^{th} class, $\tau_{1,i}$ = mean time to first reach the i^{th} class from the class 1, Ω_i = the conditional remaining life-span of individuals in the i^{th} class and Λ_i = total conditional life-span if class i have been reached. Calculations were based on the average matrix calculated over four one-year transitions.

Andropogon canaliculatus

	y_i	S_i	$\tau_{1,i}$	Ω_i	Λ_i
Early fire					
Class 1	47.4± 56.6	17.5±23.6	8.3±13.7	16.7± 62.1	25.1± 75.9
Class 2	57.8±57.7	25.6±25.3	8.8±8.8	20.3±68.3	29.1±77.2
Class 3	59.8±57.8	27.5±25.4	9.7±8.1	26.5±78.0	36.2±86.2
Class 4	61.0±57.8	28.6±25.5	13.6±11.1	31.7±85.5	45.4±96.6
Class 5	60.5±57.8	28.0± 25.5	10.9±9.4	40.7±95.9	51.7±105.3
Mean	57.3	25.4	10.2	27.1	37.5
Mid-season fire					
Class 1	30.7±36.8	12.0±15.9	4.7 ±8.0	11.3±39.9	16.1±48.0
Class 2	38.7±37.8	18.3±17.2	4.7±4.0	18.3±50.9	23.1±55.0
Class 3	41.1±37.9	20.4±17.3	8.6±6.3	21.7±55.7	30.3±62.0
Class 4	41.3±38.0	20.5±17.4	15.7±13.2	20.7±54.8	36.4±68.0
Class 5	43.1±38.0	22.2±17.5	18.3±15.1	20.5±55.0	38.9±70.2
Mean	38.9	18.6	10.4	18.5	28.9
Late fire					
Class 1	36.1±44.3	7.5±10.8	4.2±7.2	7.6±44.3	11.9±51.6
Class 2	44.2±45.5	12.2±12.2	5.5±5.7	9.8±51.9	15.4±57.6
Class 3	47.0±45.7	14.3±12.6	7.1±5.8	14.1±64.9	21.3±70.7
Class 4	49.7±45.8	16.5±12.8	10.5±7.4	20.1±79.7	30.6±87.2
Class 5	51.6±45.8	18.1±13.0	11.5±7.8	28.2±95.2	39.7±103.1
Mean	45.7	13.7	7.7	15.9	23.7
No-fire					
Class 1	28.3±43.4	3.1±5.4	2.3±4.4	4.7±40.9	7.0±45.3
Class 2	45.0±48.1	8.1±8.2	5.2±5.6	6.6±51.1	11.9±56.8
Class 3	49.3±48.5	10.3±9.0	5.2±4.1	9.7±66.2	14.9±70.3
Class 4	52.1±48.7	12.3±9.3	7.4±4.9	12.1±77.4	19.6±82.4
Class 5	54.2±48.7	14.3±9.4	9.9±6.1	14.0±84.4	24.0±90.6
Mean	45.7	9.6	6	9.4	15.4

Andropogon schirensis

	y_i	S_i	$\tau_{1,i}$	Ω_i	Λ_i
Early fire					
Class 1	13.2± 20.6	9.9± 15.9	5.3±10.5	11.7±22.4	17.0±32.9
Class 2	24.1±23.8	19.5±19.0	6.2±6.1	15.3±25.1	21.6±31.3
Class 3	25.9±24.0	21.2±19.3	7.5±5.9	21.9±28.7	29.4±34.6
Class 4	27.6±24.1	22.9±19.4	12.2±9.5	24.5±29.8	36.8±39.4
Class 5	29.3±24.1	24.5±19.4	15.8±12.1	50.3±26.9	66.2±39.1
Mean	22.9	19.6	9.4	24.7	34.2
Mid-season fire					
Class 1	46.3±69.9	16.1±29.2	8.8±20.0	16.7±68.6	25.6±88.6
Class 2	72.5±76.7	32.9±36.0	10.8±13.8	25.4±84.9	36.3±98.7
Class 3	79.7±77.1	39.3±36.7	7.6±5.8	38.6±104.2	46.3±110.0
Class 4	81.3±77.2	40.7±36.8	10.8±8.1	48.8±116.4	59.6±124.5
Class 5	81.3±77.2	40.6±36.8	20.6±18.2	43.2±110.5	63.8±128.7
Mean	72.2	33.9	11.7	34.5	46.3
Late fire					
Class 1	53.6±59.4	1.6±1.5	1.3±1.2	2.4±66.6	3.7±67.9
Class 2	61.0±59.9	3.7±2.3	2.9±1.5	3.0±79.2	5.9±80.7
Class 3	61.9±59.9	4.2±2.4	3.8±2.1	2.9±79.3	6.7±81.4
Class 4	63.1±59.9	5.3±2.4	5.1±2.3	3.3±85.4	8.4±87.8
Class 5	NaN	NaN	NaN	3.3±87.2	NaN
Mean	59.9	3.7	3.2	2.9	6.1
No-fire					
Class 1	8.2±11.8	3.4±4.7	2.2±3.4	5.2±14.9	7.5±18.3
Class 2	13.0±13.2	6.5±5.7	4.3±3.7	6.1±16.5	10.5±20.3
Class 3	14.6±13.6	7.6±6.1	5.0±3.7	6.9±18.2	11.9±21.9
Class 4	17.4±14.0	9.7±6.6	8.3±5.4	7.4±19.3	15.8±24.7
Class 5	8.2±14.2	12.0±6.9	8.5±4.7	8.9±22.1	17.5±26.9
Mean	12.2	7.8	5.6	6.9	12.6

Hyparrhenia diplandra

	y_i	S_i	$\tau_{1,i}$	Ω_i	Λ_i
Early fire					
Class 1	45.6±60.7	6.7±11.5	4.7±9.2	10.4±69.7	15.1±78.9
Class 2	62.0±63.6	14.4±14.7	6.2±6.8	13.4±79.9	19.6±86.7
Class 3	65.3±63.8	16.8±15.1	7.0±5.8	15.4±87.0	22.5±92.9
Class 4	67.7±63.9	18.8±15.3	10.6±7.7	17.8±94.9	28.5±102.6
Class 5	67.9± 63.9	18.8±15.5	10.1±8.4	19.5±100.5	29.7±109.0
Mean	61.7	15.1	7.7	15.3	23
Mid-season fire					
Class 1	15.4±25.5	4.7±8.3	2.8±6.0	6.6±27.4	9.5±33.5
Class 2	28.6±30.1	11.5±11.8	6.0±6.4	9.8±34.6	15.8±41.1
Class 3	32.4±30.5	14.4±12.4	6.2±4.5	13.2±41.3	19.5±45.9
Class 4	34.7±30.7	16.3±12.6	8.6±5.8	18.1±49.1	26.7±55.0
Class 5	35.9±30.7	17.4±12.8	12.8±9.4	16.7±48.1	29.6±57.6
Mean	29.3	12.8	7.2	12.8	20.2
Late fire					
Class 1	13.4±16.3	2.1±2.4	1.7±2.0	3.2±19.6	4.9±21.7
Class 2	17.8±16.9	4.4±3.1	3.3±2.1	3.3±20.5	6.7±22.7
Class 3	18.6±16.9	5.0±3.2	3.9±2.3	4.1±24.2	8.0±26.6
Class 4	19.6±17.0	5.7±3.4	5.3±3.2	4.8±27.1	10.2±30.3
Class 5	20.5±17.0	6.5±3.4	6.0±3.1	8.6±38.1	14.7±41.3
Mean	17.9	4.7	4	4.8	8.9
No-fire					
Class 1	12.8±19.2	3.9±6.3	2.8±5.0	6.4±23.7	9.3±28.7
Class 2	21.2±21.6	8.7±8.3	4.7±4.5	8.2±27.3	13.0±31.9
Class 3	23.7±21.8	10.6±8.7	5.7±4.1	9.6±30.1	15.4±34.2
Class 4	25.5±21.9	12.2±8.8	8.8±5.8	10.5±31.6	19.3±37.5
Class 5	26.5±22.0	13.1±8.9	10.5±6.9	11.3±32.9	21.8±39.8
Mean	21.9	9.7	6.5	9.2	15.7

Loudetia simplex

	y_i	S_i	$\tau_{1,i}$	Ω_i	Λ_i
Early fire					
Class 1	13.2±17.0	-246.7±238.5	40.9±48.3	-196.5±NaN	-155.6±NaN
Class 2	18.7±17.9	-238.1±238.6	6.7±6.3	-212.6±NaN	-205.9±NaN
Class 3	20.3±18.0	-236.2±238.6	9.6±7.7	-269.9±NaN	-260.3±NaN
Class 4	21.5±18.1	-234.9±238.7	181.6±178.3	-275.1±NaN	-93.5±NaN
Class 5	22.4±18.1	-234.0±238.7	188.8±185.1	-788.9±NaN	-600.0±NaN
Mean	19.2		85.5		
Mid-season fire					
Class 1	34.1±35.6	5.2±5.7	1.9±2.3	6.0±46.2	8.0±48.6
Class 2	37.5±35.7	7.8±6.1	4.7±3.2	7.0±50.8	11.7±54.1
Class 3	37.9±35.7	8.1±6.1	6.2±4.6	6.8±50.3	13.1±55.0
Class 4	38.4±35.7	8.5±6.1	8.1±5.9	7.0±51.2	15.1±57.2
Class 5	40.3±35.8	10.2±6.2	9.4±6.1	7.4±53.1	16.8±59.3
Mean	37.6	7.9	6	6.8	12.9
Late fire					
Class 1	12.0±14.6	2.0±2.1	1.5±1.7	2.8±17.5	4.4±19.3
Class 2	16.1±15.1	4.1±2.7	2.9±1.7	3.4±20.0	6.3±21.7
Class 3	17.6±15.2	5.1±3.0	4.1±2.2	3.9±22.2	8.0±24.4
Class 4	18.7±15.2	6.1±3.0	6.0±2.9	4.2±23.9	10.3±26.9
Class 5	19.0±15.2	6.4±3.0	6.3±3.0	3.8±22.5	10.2±25.5
Mean	16.6	4.7	3.3	3.6	7.8
No-fire					
Class 1					
Class 2					
Class 3	-	-	-	-	-
Class 4					
Class 5					
Mean					

Figures

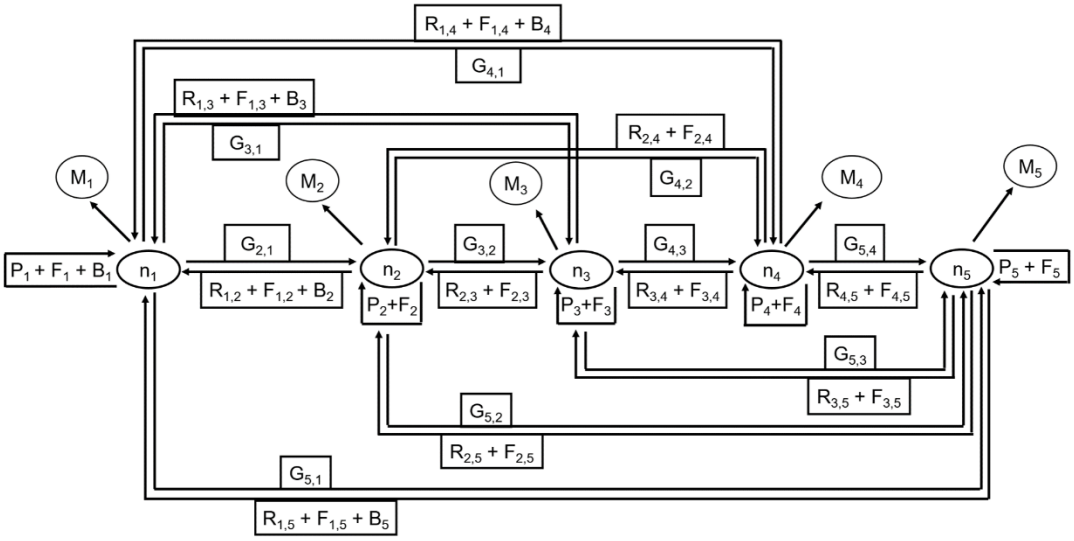

Figure S1: Life-cycle diagram of the five size-class matrix model from Koffi et al. (2022). The letters denote: (n) the number of individuals in each class, (M) the mortality, (G) the probability of surviving and reaching a larger size-class, (P) the probability of surviving and staying in the same size-class, (R) the probability of surviving and retrogression to a smaller size-class, (F) the probability of new tussocks apparition through fragmentation and (B) the production of new tussocks through seed production. The subscript letters (i,j) denote a transition from size-class j to size-class i (or a production of tussocks in size-class i by individuals in size-class j).