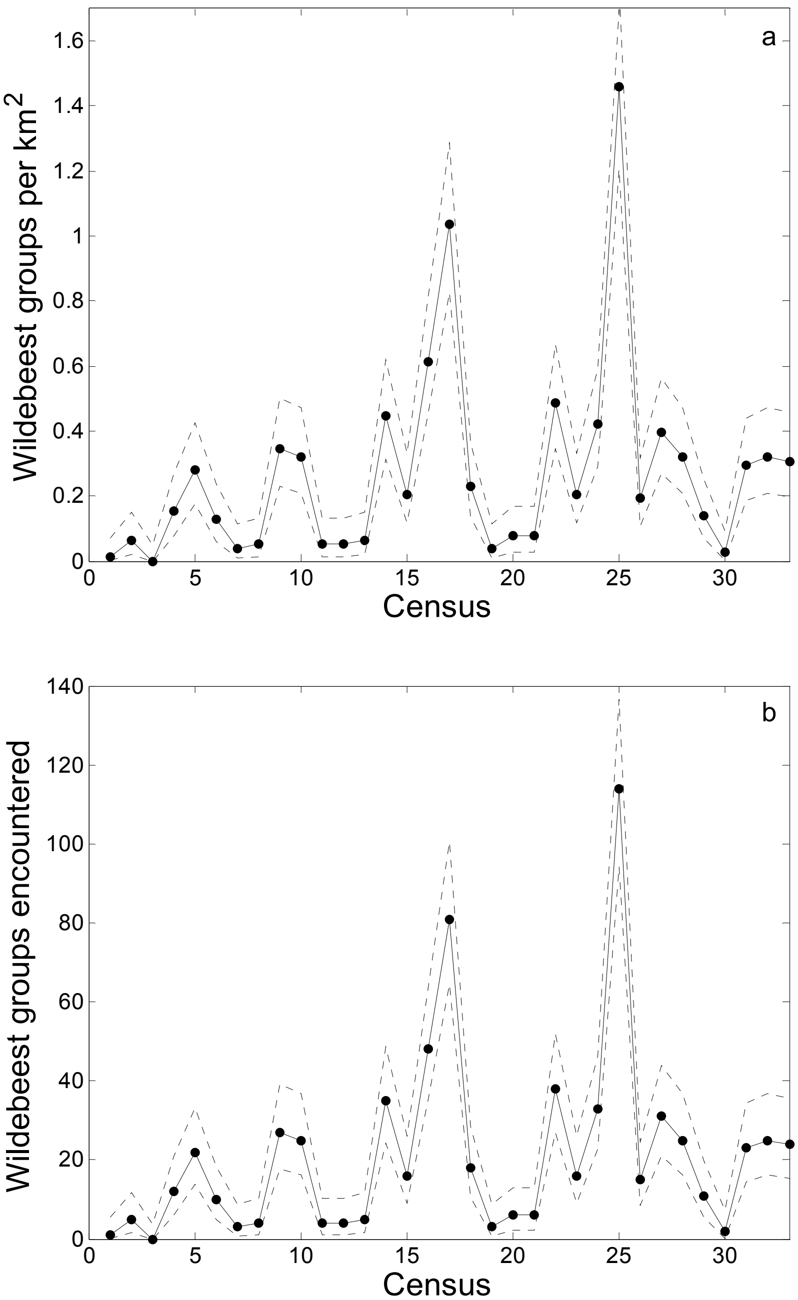
Supplementary Information

Supplementary Table 1 – Prey group density in relation to population density, based on a power relationship $y = c \cdot N^b$, where y = prey groups per km^2 and N = prey individuals per km^2. Values of t refer to the statistical test that the exponent of relationship $b = 1$, with critical value of $t_{0.001(2),30} = 3.646$.

Species	prey group parameter *c*	Prey group parameter *B*	t (b = 1)	P	R^2	df
wildebeest	0.0427	0.5453	13.91	<0.001	0.900	1,31
zebra	0.0714	0.6999	11.07	<0.001	0.956	1,31
Thomson's gazelle	0.0814	0.7363	14.89	<0.001	0.982	1,31
Grant's gazelle	0.1012	0.7616	5.92	<0.001	0.920	1,31
topi	0.1671	0.7298	5.61	<0.001	0.881	1,31
kongoni	0.1327	0.7543	11.32	<0.001	0.975	1,31
warthog	0.3005	0.8887	4.52	<0.001	0.977	1,31
Cape buffalo	0.1081	0.6015	6.57	<0.001	0.760	1,31

Supplementary Figure 1



Variation over time (2004-2007) in (a) wildebeest group density per km^2 and (b) the number of wildebeest groups encountered across the Serengeti lion study site. 95% confidence limits are shown by dotted lines in each case, assuming a binomial sample error distribution.

Supplementary equations - Equilibria and community matrix coefficients for the lion-wildebeest model.

$$N_{eq} = e^{\frac{\ln\left[d\cdot\frac{G}{a\cdot c\cdot\left(\varepsilon - d\cdot G\cdot h_1 - d\cdot h_2\right)}\right]}{b}}$$

$$P_{eq} = \frac{r_{max}\cdot N_{eq}\cdot\left[1-\left(\frac{N_{eq}}{K}\right)^{\theta}\right]\cdot\left[G + a\cdot c\cdot N_{eq}{}^{b}\cdot\left(G\cdot h_1 + h_2\right)\right]}{a\cdot c\cdot N_{eq}{}^{b}}$$

$$\alpha_{11} = r_{max}\cdot\left[1-\left(\frac{N}{K}\right)^{\theta}\cdot(\theta+1)\right] + \frac{-a\cdot c\cdot b\cdot N^{b}\cdot P}{N\cdot\left[G + a\cdot c\cdot N^{b}\cdot\left(G\cdot h_1 + h_2\right)\right]} + \frac{a^2\cdot c^2\cdot b\cdot P\cdot\left(N^{b}\right)^2\cdot\left(G\cdot h_1 + h_2\right)}{\left[G + a\cdot c\cdot N^{b}\cdot\left(G\cdot h_1 + h_2\right)\right]^2\cdot N}$$

$$\alpha_{12} = (-a\cdot c)\cdot\frac{N^{b}}{G + a\cdot c\cdot N^{b}\cdot\left(G\cdot h_1 + h_2\right)}$$

$$\alpha_{21} = \left[\frac{b\cdot\varepsilon\cdot a\cdot c\cdot N^{b}}{N\cdot\left[G + a\cdot c\cdot N^{b}\cdot\left(G\cdot h_1 + h_2\right)\right]} - \frac{\left(N^{b}\right)^2\cdot\varepsilon\cdot a^2\cdot c^2\cdot b\cdot\left(G\cdot h_1 + h_2\right)}{\left[G + a\cdot c\cdot N^{b}\cdot\left(G\cdot h_1 + h_2\right)\right]^2\cdot N}\right]\cdot P$$

$$\alpha_{22} = \varepsilon\cdot a\cdot c\cdot\frac{N^{b}}{G + a\cdot c\cdot N^{b}\cdot\left(G\cdot h_1 + h_2\right)} - d$$