

Guild vertical stratification and drivers of bat foraging activity in a semi-arid tropical region, Kenya.

Supplementary materials

Table S1. Summary of the data recorded from bats captured in mistnets (Nets) or roosts (Roost). The gender of each bat is defined as female (F) or male (M), its age as young (Y) or adult (A), and reproductive status as having small (S), medium (M), or large (B) testes (T) or nipples (N). The presence of false nipples (FN) and eventual pregnancies (Preg) are also listed. The length of the forearm, noseleaf (Nleaf), tragus, ear, and tail are indicated in millimeters, while the weight is in grams. We measured and averaged the average frequency of maximum power (FMaxE, kHz), minimum frequency (FMin, kHz), duration (Dur, ms), and interval (Int, ms) from five pulses of echolocation calls recorded when bats were released. The shape of the pulses was classified as modulated (FM), constant (CF), or quasi-constant (QCF) frequencies.

Species	Method	Date	YY	XX	Gender	Age / Cycle	Forearm	Weight	Nleaf	Tragus	Ear	Tail	Recording	FMaxE	FMin	Dur	Int	Shape
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	F	A / SN	54.8	24.5	11.4	16.4	37.7							
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	F	A / SN	54.3	29.5	11.7	16.9	35.4		_204117 A	45.16	40.08	1.1	53	FM
<i>Lavia frons</i>	Nets	30/11/2016	0.2773	37.722	M	A / ST	56.6	20.5	22.8	24.6	40		_205847 A					
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	M	A / ST	52.4	27.5	12.6	13.7	31.8		_210759 A	43.98	36.06	1.48	142.6	FM
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	M	A / ST	57.1	29.5	13.4	17.6	36.8		_211613 A	49.42	39.4	2.94	60.6	FM
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	F	A / Preg	58.9	34.5	13.1	19.4	34.4		_212147 A	49.2	38.46	1.18	30.6	FM
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	M	A / MT	53.6	30	13	15.7	34.7		_212614 A					
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	F	A / FN / MN	56	35.5	12.2	14.9	37.2		_212942 A	46.48	38.88	1.54	23.42	FM
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	M	A / MT	55.1	29	13.1	16.2	33.4		_213437 A					
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	F	A / FN / MN / Preg	54.8	32	13.1	14.1	37.4		_213936 A	48.3	38.8	0.41	24.17	FM
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	M	A / MT	55.3	26	12.8	16.4	37.2		_214505 A					
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	M	A / ST	56.4	29.5	13.2	17.2	37.5		_214912 A	47.1	37.58	2.22	67.46	FM
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	F	A / SN	57.1	29	12.4	15.8	36.2		_215221 A	49.38	40.18	2	71.04	FM
<i>Cardioderma cor</i>	Nets	30/11/2016	0.2773	37.722	F	A / SN	54.4	24	12.5	14.5	33.4		_215716 A	49.58	40.06	2.86	61.46	FM
<i>Lavia frons</i>	Nets	02/12/2016	0.3141	37.726	M	A / ST	57.25	23.5	20.7	25.4	38		_201727 A	34.22	28.5	0.93	28	FM
<i>Lavia frons</i>	Nets	02/12/2016	0.3141	37.726	F	A / SN	59.6	26	21.6	24.7	42.6		_203312 A					

Species	Method	Date	YY	XX	Gender	Age / Cycle	Forearm	Weight	Nleaf	Tragus	Ear	Tail	Recording	FMaxE	FMin	Dur	Int	Shape
<i>Cardioderma cor</i>	Nets	04/12/2016	0.3500	37.676	F	A / SN	57.5	27.5	13.6	13.6	41.1		_193201 A	49.56	43.62	1.67	26.94	FM
<i>Cardioderma cor</i>	Nets	04/12/2016	0.3500	37.676	F	A / SN	54.6	27.5	15.1	15.1	33.9							
<i>Cardioderma cor</i>	Nets	04/12/2016	0.3493	37.676	F	A / SN	57	31.5	15.2	15.2	28.6							
<i>Nycticeius schlieffeni</i>	Nets	04/12/2016	0.3500	37.675	M	A / MT	32.9	8			8.3	40.2	_201044 A					
<i>Lavia frons</i>	Nets	04/12/2016	0.3493	37.676	M	A / ST	58.6	33.2	20.5	22.1	38.1		_201623 A	37.14	28.66	1.71	40.75	FM
<i>Lavia frons</i>	Nets	04/12/2016	0.3493	37.676	F	A / FN / SN	62	30.05	23.9	27.7	42.5							
<i>Cardioderma cor</i>	Nets	04/12/2016	0.3493	37.676	M	A / ST	52.6	28.5	10.8	12.4	29.8		_203704 A	47.28	42.82	0.6	25.97	FM
<i>Lavia frons</i>	Nets	04/12/2016	0.3500	37.675	F	A / SN	62.6	29	23.9	28.1	43.3		_215751 A	31.5	27.76	0.8	56.92	FM
<i>Lavia frons</i>	Nets	05/12/2016	0.3356	37.746	F	A / FN / BN	61	31.5	23.3	29.9	45.4		_195431 A	37.28	27.24	2.92	121.9	FM
<i>Cardioderma cor</i>	Nets	05/12/2016	0.3363	37.746	F	A / BN	57.4	31.5	13.6	33.8	13.7		_211748 A	43.86	38.08	1.44	235.7	FM
<i>Lavia frons</i>	Nets	07/12/2016	0.2941	37.679	F	A / SN	62.5	25.5	22.8	24.2	40.7							
<i>Lavia frons</i>	Nets	07/12/2016	0.2949	37.679	F	A / FN / BBN	61.3	25	25	26	40							
<i>Lavia frons</i>	Nets	07/12/2016	0.2941	37.679	M	A / ST	59.4	21	20.7	23.3	40							
<i>Scotoecus sp.</i>	Nets	07/12/2016	0.2949	37.679	F	Y	29.2	5				24.1						
<i>Scotophilus andrewreborii</i>	Roost	08/12/2016	0.2617	37.75	F	Y	41	28.5										
<i>Lavia frons</i>	Nets	08/12/2016	0.3226	37.636	F	A / FN / BN	62.8		24.9	27.8	45.7							
<i>Lavia frons</i>	Nets	08/12/2016	0.3226	37.636														
<i>Lavia frons</i>	Nets	08/12/2016	0.3226	37.636														
<i>Lavia frons</i>	Nets	08/12/2016	0.3227	37.636	F	A / FN / BN	62.5	30	23.2	26.5	43.8							
<i>Scotophilus andrewreborii</i>	Nets	08/12/2016	0.3235	37.636	M	A / ST	51.8	23.5				52.5						
<i>Lavia frons</i>	Nets	09/12/2016	0.3350	37.693	M	A / ST	56.1	18.5	21.9	25.5	39.5							
<i>Lavia frons</i>	Nets	09/12/2016	0.3357	37.692	M	A / MT	56.9	20	21.4	25.4	41.9		_195250 A	35.18	31.38	0.76	22.55	FM
<i>Lavia frons</i>	Nets	09/12/2016	0.3357	37.692	F	A / FN / BBN	60.8	28	22.1	25.3	40.3		_195713 A	35.06	28.76	1.58	52.67	FM
<i>Cardioderma cor</i>	Nets	09/12/2016	0.3355	37.692	M	A / ST	55.6	29	14	17.6	41.5		_203426 A	41.98	37.94	0.71	21.56	FM
<i>Cardioderma cor</i>	Nets	09/12/2016	0.3355	37.692	M	A / BT	56.6	27.5	15.3	19.7	40.1		_204007 A	42.7	37.82	0.96	25.25	FM
<i>Cardioderma cor</i>	Nets	09/12/2016	0.3342	37.693	M	A / MT	54.8	27	14.6	18.4	38.4							

[illegible]

Species	Method	Date	YY	XX	Gender	Age / Cycle	Forearm	Weight	Nleaf	Tragus	Ear	Tail	Recording	FMaxE	FMin	Dur	Int	Shape
<i>Epomophorus minimus</i>	Nets	21/05/2017	0.3019	37.736	M	A / BT	58.8	36.5			14							
<i>Epomophorus minimus</i>	Nets	21/05/2017	0.3019	37.736	M	A / BT	58	40.5			16.3							
<i>Epomophorus minimus</i>	Nets	21/05/2017	0.3019	37.736	M	J / ST	56.4	31			15							
<i>Epomophorus minimus</i>	Nets	21/05/2017	0.3019	37.736	F	A / SN	59.1	39			17.1							
<i>Scotophilus andrewreborii</i>	Nets	21/05/2017	0.3019	37.736	F	A / SN / Preg?	24.4						_213621 D	33.66	30.8	3.42	88.4	FM(i)
<i>Epomophorus minimus</i>	Nets	22/05/2017	0.3224	37.715	M	ST	56.7	41.5			16.6							
<i>Cardioderma cor</i>	Nets	22/05/2017	0.3224	37.715														
<i>Scotophilus andrewreborii</i>	Roost	12/05/2017	0.3048	37.666														
<i>Molossidae</i>	Roost	12/05/2017	0.3048	37.666														
<i>Neoromicia somalica</i>	Nets	26/09/2017	0.3500	37.676	F	A / SN	32.5	10			9.7	32.6	_193456 A	44.2	35	2.1	27.2	FM/CF
<i>Lavia frons</i>	Nets	26/09/2017	0.3493	37.676	M	A / ST	57.3	18.5	28.4	34.6	45.3		_195251 A	37.32	26.91	2.5	112.9	FM
<i>Cardioderma cor</i>	Nets	26/09/2017	0.3500	37.676	M	A / ST?	56.8	28.5	15.5	18.1	35.8		_211604 A	43.1	39.1	1.03	52.4	FM
<i>Cardioderma cor</i>	Nets	27/09/2017	0.3354	37.692	M	A / ST	53.4	26	13	16.8	37.2		_203142 A	44.2	38.3	1.9	49.2	FM
<i>Lavia frons</i>	Nets	28/09/2017	0.3362	37.746	F	A / FN / BN	60.5	22.5	21.4	26.9	40.9		_190603 A					
<i>Lavia frons</i>	Nets	29/09/2017	0.3396	37.701	M	A / ST	60.4	21.5	21.9	25.1	41.6		_193554 D	37	29.2	2	138	FM
<i>Cardioderma cor</i>	Nets	29/09/2017	0.3414	37.699	M	A / MT	56.5	28.5	14.8	14.2	33.6		_200246 D	51.3	42	2.3	62.3	FM
<i>Lavia frons</i>	Nets	29/09/2017	0.3415	37.699	F	A / FN / BN	60.9	23.5	22.3	25.4	41.7		_200401 D	33.6	28	1.05	117	FM
<i>Cardioderma cor</i>	Nets	29/09/2017	0.3415	37.699	M	Y / ST	56.7	28	13.7	15.5	34.6							
<i>Epomophorus minimus</i>	Nets	30/09/2017	0.3223	37.716	M	Y / ST	58	41			19.4							
<i>Epomophorus minimus</i>	Nets	30/09/2017	0.3223	37.716	M	A / ST	57.1	38			15.7							
<i>Epomophorus minimus</i>	Nets	30/09/2017	0.3223	37.716	F	F	60.8	41.5			19.2							
<i>Epomophorus minimus</i>	Nets	30/09/2017	0.3222	37.714	M	A / ST	58.3	39.5			19.7							
<i>Epomophorus minimus</i>	Nets	30/09/2017	0.3209	37.716	M	A / ST	58.9	41			17.8							
<i>Epomophorus minimus</i>	Nets	30/09/2017	0.3209	37.716	M	A / ST	56.6	43			15.5							
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / BT	56.3	39.5			15.9							
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / BT	59.5	42			17.5							

Species	Method	Date	YY	XX	Gender	Age / Cycle	Forearm	Weight	Nleaf	Tragus	Ear	Tail	Recording	FMaxE	FMin	Dur	Int	Shape
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / BT	55.7				12.8							
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / BT	56.9	35.5			15.4							
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / BT	57.6	40			17.2							
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / BT	56.2	37			15.2							
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / MT	57.6	31.5			16.9							
<i>Epomophorus minimus</i>	Nets	01/10/2017	0.3143	37.727	M	A / MT	57.9	38.5			16.9							
<i>Nycticeius schlieffeni</i>	Nets	01/10/2017	0.3143	37.727	M	A / BT	33	5.5			8	33.5	_200203 D	41.3	36	3.7	86.3	FM/CF
<i>Nycticeius schlieffeni</i>	Nets	01/10/2017	0.3143	37.727	M	A / ST	34	7			9.3	37.3	_203537 D	40.1	35.3	3.09	84.1	FM/CF
<i>Hipposideros caffer</i>	Nets	01/10/2017	0.3143	37.727	F	Y / SN	46.9				11.4	27.4	_200803 D	154.1	118	6.9	16.3	CF/FM
<i>Laephotis kirinyaga</i>	Nets	01/10/2017	0.3143	37.727	M	A / MT	28.2	4			7.1	23	_204639 D	40.7	38	3.4	88.4	FM/CF
<i>Mops pumilla</i>	Nets	01/10/2017	0.3144	37.726	M	Y / ST	20	9			5.4	16.8	_212651 D	22.5	19.2	6.4	129.5	QCF
<i>Mops pumilla</i>	Nets	01/10/2017	0.3144	37.726	M	A / ST	37	10			10.2	26.8	_214207 A	24.8	20.2	6.3	171.5	QCF
<i>Mops pumilla</i>	Nets	01/10/2017	0.3144	37.726	M	A / MT	40	12			13.1	30.1	_214756 A	23.1	19.1	5.4	56.7	QCF
<i>Mops pumilla</i>	Nets	01/10/2017	0.3144	37.726	F	Y / SN	35.3				9.1	24.9	_223702 A	21.9	19.3	10.2	444.0	QCF
<i>Mops pumilla</i>	Nets	01/10/2017	0.3144	37.726	M	A / BT	37.9	10.5			11	30.1						
<i>Scotoecus sp.</i>	Nets	01/10/2017	0.3144	37.726	F	A / BN / Preg	34.6	13			8.9		_224500 A	37.8	34	4.8	72.9	FM/CF
<i>Mops condylurus</i>	Nets	01/10/2017	0.3143	37.727	M	A / MT	44.6	16.5			12.5	37.2	_224705 A	24.5	19.3	5.7	92.3	QCF
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2819	37.722	F	A / BN	56.7	29	13.9	20	33.9							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2819	37.722	F	A / BN	58.5	28	12.6	19.2	39.8							
<i>Lavia frons</i>	Nets	02/10/2017	0.2819	37.722	M	A / ST	59.2	20	20.8	28.1	44.9							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	M	A / ST	52		12.6	15.9	35							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / SN	56.1	28	14.7	18.6	36.3							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / BN	59.2	29.5	16	20.8	35.1							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / FN / BN	54.6	27.5	14.8	16.3	30.2							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / BN	56.4	28	16.3	21.1	33.4							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / FN / BN	58.9	28.5	14.5	22.2	32.3							

<i>Species</i>	Method	Date	YY	XX	Gender	Age / Cycle	Forearm	Weight	Nleaf	Tragus	Ear	Tail	Recording	FMaxE	FMin	Dur	Int	Shape
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / BN	57	27	14.7	20.6	35.2							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / FN / BN	57.6		15.1	22.1	37							
<i>Cardioderma cor</i>	Nets	02/10/2017	0.2815	37.722	F	A / FN / BN	56.8	28.5	14.2	17.1	32							

Table S2. Spearman correlation matrices displaying the correlation values between continuous independent variables. The top table summarizes the variables considered when modeling bat guild occurrence at ground level, while the bottom table pertains to the environmental variables used when modeling bat activity at height. For detailed information on each variable, please refer to Table 2 in the main document. It is worth noting that the correlation values, except for one, are all below 0.7, indicating the absence of strong correlations among variables. The only exception is the correlation between Relative and Absolute humidity (highlighted in bold) among the variables measured at height. As a result, these two variables were never included together in the same model.

<i>Ground variables</i>	<i>RH</i>	<i>T</i>	<i>DEM</i>	<i>Dist_water</i>	<i>NDVI_Apr</i>	<i>Moon</i>
Relative Humidity (RH)	1					
Temperature (T)	-0.4235	1				
DEM	-0.11092	0.023305	1			
Dist to watercourses	0.00991	-0.01342	0.044561	1		
NDVI_April	-0.07732	0.090435	-0.21555	-0.304713	1	
Illuminated moon	-0.30516	0.214421	-0.21384	0.00019854	0.1473429	1

<i>Height variables</i>	<i>T</i>	<i>RH</i>	<i>AH</i>	<i>Moon</i>	<i>Wind</i>
Temperature (T)	1				
Relative Humidity (RH)	-0.33007	1			
Absolute Humidity (AH)	-0.04556	0.89391	1		
Illuminated moon	0.04281	-0.31806	-0.39416	1	
Wind speed	-0.40951	-0.03054	-0.13291	0.15832804	1

Table S3. Binomial generalized linear models of bat-guild occurrence at the study area using ground-sampling data. Guild 6 was excluded due to the low number of observations. Variable names and descriptions are indicated in Table 1, guild descriptions and acronyms in Table 2. Significant results (p-value < 0.05) are highlighted in bold.

	<i>High-flying Guild 1</i>			<i>High-flying Guild 2</i>			<i>Medium-flying Guild 3</i>			<i>Medium-flying Guild 4</i>			<i>Low-flying Guild 5</i>		
Fixed	β	SE	p	β	SE	p	β	SE	p	β	SE	p	β	SE	p
Intercept	-8.031	1.583	<0.001	-0.727	0.357	0.041	-3.285	0.390	<0.001	-1.286	0.841	0.126	-6.926	1.420	<0.001
Wind Class	-0.336	0.122	0.006	-0.578	0.088	<0.001	-0.188	0.079	0.017	-0.221	0.112	0.048			
Moon				-1.815	0.394	<0.001									
RH	0.407	0.0.93	<0.001												
Landcover - Fallow				1.533	0.523	0.003	2.173	0.533	<0.001						
Farmed				3.931	1.118	<0.001	1.584	0.612	0.010						
Mosaic				1.278	0.526	0.015	2.153	0.543	<0.001						
Scrub				1.549	0.505	0.002	2.205	0.537	<0.001						
Village				1.359	1.035	0.189	3.194	0.974	0.001						
Waterline				1.379	0.474	0.003	2.122	0.511	<0.001						
Wood sparse				1.117	0.469	0.017	0.975	0.507	0.055						
NDVI										4.061	2.090	0.050	11.306	3.675	0.002

Table S4. Negative binomial generalized linear mixed models resuming the effect of environment variables and height on the activity of high-flying guilds as recorded at four automatic stations. The activity at 20 m was taken as a reference for the categorical variable height. Significant results (p-value < 0.05) are highlighted in bold.

	<i>High-flying Guild 1</i>			<i>High-flying Guild 2</i>			<i>Medium-flying Guild 3</i>		
Fixed	β	SE	p	β	SE	p	β	SE	p
Intercept	-2.806	0.489	<0.001	-1.133	0.671	0.091	-3.466	0.510	<0.001
Height - 35m	-0.361	0.096	<0.001	-0.272	0.037	<0.001	-1.367	0.085	<0.001
Ab. Humidity	0.156	0.026	<0.001	0.171	0.010	<0.001	0.309	0.024	<0.001
Temperature				0.068	0.023	0.003			
Wind Speed	-0.325	0.132	0.013	-0.364	0.064	<0.001	-0.630	0.104	<0.001
Random	Var	SE	Groups	Var	SE	Groups	Var	SE	Groups
Season	0.286	0.535	4	0.205	0.453	4	0.465	0.682	4
Site	0.003	0.054	2	0.041	0.202	2	0.038	0.194	2