Supplementary Materials for

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Section S1:

Sampling methods for data collection across 5 taxonomic groups

Perennials:

Perennial Plant Cover (PPC) was measured as the average percentage cover across all years. Each dune was divided into 3 slopes; wind-face, crest and slip-face. Cover for each slope was measured using three 50m transects running parallel to the length of each slope (9 transects per dune). Total cover per slope was then standardized by slope width to give the total cover per dune. Dunes with 0-15% PPC are classified as 'mobile' dunes, 16-30% PPC as 'semi-fixed' dunes, and dunes with PPC greater than 30% are considered 'fixed' dunes following previous research conducted in Nizzanim LTER [53,63–67,75].

Annuals:

Seventy-two 40x40cm quadrats per dune were measured each spring. Each dune was divided into 3 slopes; wind-face, crest and slip-face and 24 quadrats per slope were placed alternately in perennial bush or open patches. Average total cover per dune was weighted by total perennial cover per slope. Hereafter, total cover of annuals refers to the weighted percentage cover for each species per sample, across all species.

Beetles:

Ground dwelling beetles were sampled using 30 dry pitfall traps per sample, arranged in a regularized pattern, with 10 traps on each slope alternately placed in perennial bush or open patches. Traps were left open for 36 hours, every spring. Species were identified to morphospecies and released when possible [53]. Unknown species were sent to the Steinhardt Museum of Natural History at Tel Aviv University for identification. Species abundance for beetles refers to the absolute abundance of each species per sample. Total abundance was pooled across all species, so that a sample is the number of individuals from all species captured on a whole dune in a single year.

Rodents:

Rodents were trapped every autumn using 36 Sherman traps per sample, arranged in a regularized pattern in 4 rows along the crest slope, with traps placed alternately in perennial bush and open patches. We used mark recapture methods over two trap nights. The corrected Chapman estimator is a less-biased form of the Lincoln-Petersen index [77], and was used to calculate estimated abundance for each species, based on the recapture data using the formula:

$$\widehat{N}_C = \frac{(n+1)(K+1)}{k+1} - 1 \qquad \text{Eq. A1}$$

where $\widehat{N}_C$ is the estimated abundance, n is the number of animals marked on the first visit, K is the number of animals captured on the second visit, and k is the number recaptured animals that were marked.

Reptiles:

Reptiles sampling is extremely sensitive to surveying methods because there are interactions between species, capture methods and habitat [65]. Therefore, a combination of pitfall traps, activity transects, track transects and opportunistic sightings were used to sample reptiles. The four methods were then combined whereby presence was ranked from 5 (high) to absent (0) using maximum rank across methods for each species independently (see [65] for a description of methods). Abundance for reptiles in this study refers to the ranked log abundance for each species per dune.

Section S2: Supporting Data

Table S1: Modelled data for demonstrating the combine effects of population stability and asynchrony on community stability as depicted in Figure 1.

Fig 1a	Time	Spp1	Spp2	Community
	1	10	17	27
	2	34	28	62
	3	13	8	21
	4	27	34	61
	5	8	17	25
	6	36	33	69
	7	17	9	26
	8	26	36	62
	9	14	20	34
	10	31	27	58
	11	18	21	39
	12	25	31	56
	Temporal S.D	9.51	9.53	**17.88**
	Temporal Mean	21.58	23.42	**45.00**
	Synchrony			Low Async
	CV	0.44	0.41	**0.397**
	Stability (CV^-1)	**2.27**	**2.46**	**2.516**

Fig 1b	Time	Spp1	Spp2	Community
	1	19	22	41
	2	26	28	54
	3	18	25	43
	4	22	27	49
	5	18	21	39
	6	22	25	47
	7	19	22	41
	8	22	26	48
	9	19	21	40
	10	25	28	53
	11	19	18	37
	12	26	22	48
	Temporal S.D	3.05	3.19	**5.59**
	Temporal Mean	21.25	23.75	**45.00**
	Synchrony			Low Async
	CV	0.14	0.13	**0.124**
	Stability (CV^-1)	**6.97**	**7.43**	**8.047**

Fig 1c	Time	Spp1	Spp2	Community
	1	10	28	38
	2	34	13	47
	3	8	33	41
	4	29	16	45
	5	13	35	48
	6	32	9	41
	7	19	33	52
	8	30	11	41
	9	14	26	40
	10	32	23	55
	11	17	33	50
	12	28	14	42
	Temporal S.D	9.59	9.76	**5.38**
	Temporal Mean	22.17	22.83	**45.00**
	Synchrony			High Async
	CV	0.43	0.43	**0.119**
	Stability (CV^-1)	**2.31**	**2.34**	**8.369**

Fig 1d	Time	Spp1	Spp2	Community
	1	19	30	49
	2	24	21	45
	3	19	25	44
	4	24	21	45
	5	18	28	46
	6	25	20	45
	7	19	26	45
	8	24	22	46
	9	19	24	43
	10	26	18	44
	11	16	25	41
	12	25	22	47
	Temporal S.D	3.45	3.48	**2.00**
	Temporal Mean	21.50	23.50	**45.00**
	Synchrony			High Async
	CV	0.16	0.15	**0.044**
	Stability (CV^-1)	**6.23**	**6.76**	**22.500**

Table S2: Regression results for all parameters

Taxa	y	x	model	correlation	r.squared	adj.r.squared	p.value	sigma	statistic	df	logLik	AIC	BIC	deviance	df.residual	KEY
annuals	Av_Richness	PPC	y ~ x	+	0.89	**0.88**	**0.000**	0.83	64.22	2	-11.18	28.37	29.28	5.48	8	***P<0.001
beetles	Av_Richness	PPC	y ~ x	-	0.69	**0.65**	**0.003**	0.66	17.99	2	-8.86	23.73	24.64	3.45	8	**P<0.01
rodents	Av_Richness	PPC	y ~ x	-	0.68	**0.64**	**0.003**	0.32	16.79	2	-1.78	9.57	10.47	0.84	8	*P<0.05
reptiles	Av_Richness	PPC	y ~ x	+	0.49	**0.42**	**0.025**	0.34	7.56	2	-2.29	10.58	11.48	0.93	8	
annuals	CVpop_av.wt	Av_Richness	y ~ x^2	∩	0.67	**0.56**	**0.035**	0.17	6.15	3	4.84	-1.69	-0.90	0.18	6	
beetles	CVpop_av.wt	Av_Richness	y ~ x	ns	0.01	**-0.12**	**0.811**	0.19	0.06	2	3.61	-1.22	-0.31	0.28	8	
rodents	CVpop_av.wt	Av_Richness	y ~ x	ns	0.00	**-0.12**	**0.972**	0.10	0.00	2	9.47	-12.95	-12.04	0.09	8	
reptiles	CVpop_av.wt	Av_Richness	y ~ x	ns	0.03	**-0.10**	**0.653**	0.06	0.22	2	15.20	-24.41	-23.50	0.03	8	
annuals	CVpop_av.wt	PPC	y ~ x^2	∩	0.63	**0.51**	**0.049**	0.18	5.17	3	4.34	-0.67	0.12	0.20	6	
beetles	CVpop_av.wt	PPC	y ~ x	ns	0.24	**0.14**	**0.153**	0.17	2.49	2	4.93	-3.86	-2.95	0.22	8	
rodents	CVpop_av.wt	PPC	y ~ x	ns	0.02	**-0.10**	**0.680**	0.10	0.18	2	9.59	-13.17	-12.27	0.09	8	
reptiles	CVpop_av.wt	PPC	y ~ x	ns	0.01	**-0.11**	**0.751**	0.06	0.11	2	15.14	-24.27	-23.37	0.03	8	
annuals	Synchrony (Phi)	Av_Richness	y ~ x^2	U	0.67	**0.56**	**0.037**	0.14	6.02	3	7.01	-6.01	-5.22	0.11	6	
beetles	Synchrony (Phi)	Av_Richness	y ~ x	-	0.60	**0.55**	**0.008**	0.09	12.12	2	10.55	-15.11	-14.20	0.07	8	
rodents	Synchrony (Phi)	Av_Richness	y ~ x	-	0.92	**0.91**	**0.000**	0.09	86.77	2	10.73	-15.46	-14.56	0.07	8	
reptiles	Synchrony (Phi)	Av_Richness	y ~ x	+	0.61	**0.56**	**0.008**	0.07	12.60	2	14.21	-22.43	-21.52	0.03	8	
annuals	Synchrony (Phi)	PPC	y ~ x^2	U	0.81	**0.75**	**0.006**	0.10	13.13	3	9.62	-11.24	-10.45	0.06	6	
beetles	Synchrony (Phi)	PPC	y ~ x	+	0.71	**0.67**	**0.002**	0.08	19.59	2	12.13	-18.27	-17.36	0.05	8	
rodents	Synchrony (Phi)	PPC	y ~ x	+	0.73	**0.70**	**0.002**	0.16	21.91	2	4.97	-3.93	-3.03	0.22	8	
reptiles	Synchrony (Phi)	PPC	y ~ x	ns	0.06	**-0.05**	**0.487**	0.10	0.53	2	9.80	-13.61	-12.70	0.08	8	
annuals	CVcomm	Av_Richness	y ~ x^2	ns	0.51	**0.35**	**0.116**	0.06	3.15	3	13.70	-19.40	-18.61	0.03	6	
beetles	CVcomm	Av_Richness	y ~ x	ns	0.35	**0.27**	**0.070**	0.16	4.36	2	5.11	-4.21	-3.30	0.21	8	
rodents	CVcomm	Av_Richness	y ~ x	-	0.66	**0.62**	**0.004**	0.09	15.88	2	10.72	-15.43	-14.53	0.07	8	
reptiles	CVcomm	Av_Richness	y ~ x	ns	0.39	**0.31**	**0.055**	0.04	5.03	2	18.55	-31.10	-30.19	0.01	8	
annuals	CVcomm	PPC	y ~ x^2	U	0.77	**0.69**	**0.012**	0.04	10.10	3	17.10	-26.20	-25.42	0.01	6	
beetles	CVcomm	PPC	y ~ x	+	0.69	**0.65**	**0.003**	0.11	17.76	2	8.78	-11.56	-10.65	0.10	8	
rodents	CVcomm	PPC	y ~ x	+	0.63	**0.58**	**0.006**	0.10	13.66	2	10.23	-14.46	-13.55	0.08	8	
reptiles	CVcomm	PPC	y ~ x	ns	0.03	**-0.10**	**0.658**	0.05	0.21	2	16.24	-26.48	-25.57	0.02	8	
annuals	CVcomm	CVpop_av.wt	y ~ x^2	∩	0.67	**0.57**	**0.035**	0.05	6.21	3	15.52	-23.04	-22.25	0.02	6	
beetles	CVcomm	CVpop_av.wt	y ~ x	+	0.60	**0.55**	**0.008**	0.13	12.20	2	7.56	-9.12	-8.21	0.13	8	
rodents	CVcomm	CVpop_av.wt	y ~ x	ns	0.28	**0.19**	**0.114**	0.14	3.14	2	6.90	-7.81	-6.90	0.15	8	
reptiles	CVcomm	CVpop_av.wt	y ~ x	ns	0.13	**0.02**	**0.310**	0.05	1.17	2	16.80	-27.59	-26.68	0.02	8	
annuals	CVcomm	Synchrony (Phi)	y ~ x	+	0.73	**0.70**	**0.002**	0.06	21.94	2	14.45	-22.89	-21.98	0.03	8	
beetles	CVcomm	Synchrony (Phi)	y ~ x	+	0.76	**0.73**	**0.001**	0.10	25.07	2	10.03	-14.05	-13.15	0.08	8	
rodents	CVcomm	Synchrony (Phi)	y ~ x	+	0.77	**0.74**	**0.001**	0.08	27.00	2	12.63	-19.26	-18.35	0.05	8	
reptiles	CVcomm	Synchrony (Phi)	y ~ x	+	0.77	**0.74**	**0.001**	0.03	26.38	2	23.40	-40.80	-39.89	0.01	8	