

**Fig. S1.** Details of processing cricket forewings for measurement of harp thickness showing the axis along which the harp was cut.

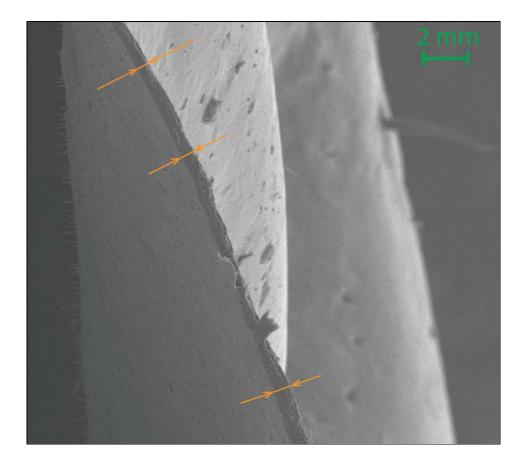
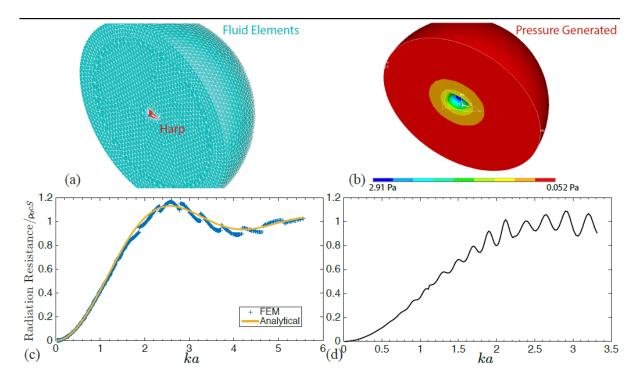


Fig. S2. SEM image of a transversely sectioned harp for thickness measurement.



**Fig. S3.** FEM acoustic simulation: (a) FE model showing the acoustic elements surrounding the harp, (b) simulated sound pressure radiated from the harp, (c) simulated and analytical results of radiation efficiency (radiation resistance/ $\rho_0 cS$ ) from a circular piston (where,  $\rho_0$  is the density of air, c is the speed of sound in air and S is the area of the radiating source), and (d) simulated radiation efficiency (radiation resistance/ $\rho_0 cS$ ) from the harp.

**Table S1.** Stridulation energetics at high frequencies: Details of calculations leading to values shown in Table 4 of manuscript. In these energetics calculations, we have travelled along two extreme directions - one, where we have kept the thickness constant and decreased the harp area and the other where we have kept the harp area constant and increased the hap thickness.

						To 20	hiovo a	cong fro	equency of	2014				
	T .				_	Increa	ising Harp	thickness,	keeping size of Fold change in	onstant T			Fold change in	ı
									rotational speed				stridulation energy (If	
									=120 (since this is				tooth spacing becomes	
									plectrum speed				12microns from a	
									needed to excite				larger spacing, more	
						Fold change			a file with tooth				teeth need to be	
		Fold	0.7*rotation			of thickness			spacing of				struck, proprtionately	
	Fold-change	increase in	al energy +			= Fold			12microns at				increasing the energy	
	in rotational	stridulation	0.3*stridula	Song		change of		Plectrum	20kHz)/scaled	Fold change in		Tooth	required for	
ipecies	energy	energy	tion energy	Frequenc		mass		Speed	plectrum speed	rotational energy		spacing	strudulation)	
Gryllodes sp.	11.70	1.8	8.73		.88	3.40		64.7	1.85	11.70		22	1.8	
T. portentosus	1.47	8.8	3.67		.12	4.85		218	0.55	1.47		106	8.8	
G. bimaculatus	7.19	3	5.94	. 4	.98	4.02		89.7	1.34	7.19		36	3.0	
						Decre	asing Harp	size, keep	ing thickness c	onstant				
														Fold change in
										Fold change in	l			stridulation energy (If tooth spacing becomes
					ı,	Fold change				rotational speed =120				12microns from a large
				1 1		of Area				(since this is plectrum				spacing, more teeth
						or Area (current song	Fold change			speed needed to	l			need to be struck,
		Fold	0.7*rotation			frequency/10	in size		Scaled plectrum	excite a file with tooth				proprtionately
	Fold-change	increase in	al energy +			kHz) = Fold	(square root		speed (due to	spacing of 12microns	Fold change		Scaled file spacing	increasing the energy
	in rotational	stridulation	0.3*stridula	Song		change of	of area fold	Plectrum	scaled plectrum	at 20kHz)/scaled	in rotational	Tooth	(assuming allometric	required for
	energy	energy	tion energy	Frequenc	- 1	mass	change)	Speed	radius)	plectrum speed	energy	spacing	scaling)	strudulation)
Gryllodes sp.	3.44	1	2.71		.88	0.29	0.54221767	64.7	35.08148315	3.42	3.44	22	11.92878871	1.
T. portentosus	0.3	4	1.41	. 4	.12	0.21	0.45387223	218	98.94414586	1.21	0.30	106	48.11045624	4.
3. bimaculatus	1.79	1.5	1.70	4	.98	0.25	0.498999	89.7	44.76021012	2.68	1.79	36	17.96396393	1.
					-									
					-									
					_	To 20	hiovo a	cona fra	quency of	10647				
	1				_	increa	ising Harp	tnickness,	keeping size o	onstant				1
									Fold change in				Fold change in	
									rotational speed				stridulation energy (If	
									=120 (since this is				tooth spacing becomes	
									plectrum speed needed to excite				12microns from a	
						Fold change			a file with tooth				larger spacing, more teeth need to be	
		Fold	0.7*rotation			of thickness			spacing of				struck, proprtionately	
	Fald about	increase in	al energy +			= Fold			12microns at		l		increasing the energy	
	Fold-change in rotational	stridulation	0.3*stridula	Song		change of		Plectrum	20kHz)/scaled	Fold change in	l	Tooth	required for	
	energy	energy	tion energy	Frequenc		mass		Speed	plectrum speed	rotational energy	l	spacing	strudulation)	
Gryllodes sp.	1.46	1.8	1.56		.88	1.70		64.7	0.93	1.46		22	1.8	
T. portentosus	0.18	8.8	2.77	4	.12	2.43		218	0.28	0.18		106	8.8	
G. bimaculatus	0.9	3	1.53	4	.98	2.01		89.7	0.67	0.90		36	3.0	
						Decrea	asing Harp	size, keep	ing thickness c	onstant				
		I			ſ									Fold change in
				1 1						L				stridulation energy (If
						F - 1 - 1 - 1 - 1 - 1				Fold change in	l			tooth spacing becomes
						Fold change				rotational speed =120 (since this is plectrum	l			12microns from a larger
						of Area (current song	Fold change			(since this is plectrum speed needed to	l			spacing, more teeth need to be struck.
		Fold	0.7*rotation			current song frequency/10	in size		Scaled plectrum	speed needed to excite a file with tooth	l			proprtionately
		increase in	al energy +			rrequency/10 kHz) = Fold	in size (square root		speed (due to	spacing of 12microns	Fold change		Scaled file spacing	increasing the energy
	Fold-change in rotational	stridulation	0.3*stridula	Song		change of	of area fold	Plectrum	speed (due to scaled plectrum	at 20kHz)/scaled	in rotational	Tooth	(assuming allometric	required for
	in rotational energy	energy	tion energy	Frequenc		cnange or mass	change)	Speed	radius)	plectrum speed	energy	spacing	(assuming allometric scaling)	strudulation)
Gryllodes sp.	0.86	1.41	1.03		.88	0 59	0.76681158		49.61270926	1 21	0.86	spacing 22	16.86985477	1.4
. portentosus	0.08	5.67	1.76		.12	0.41	0.64187226		139.928153	0.43	0.08	106	68.03845971	
G. bimaculatus	0.45	2.12	0.95		.98	0.50	0.70569115		63,30049621		0.45	36		

**Table S2.** In these energetics calculations, we have investigated an intermediate combination of thickness increase together with decreased harp size to arrive at the energy required to call at 20kHz and 10kHz.

							To acl	hieve a s	ong fre	equency	of 20kHz					
							Decreas	ing Harp si	ze, and in	creasing th	ickness 2 fold					
	Fold-change in rotational energy	Fold increase in stridulation energy	0.7*rotatio nal energy + 0.3*stridula tion energy			Fold change of thickness	of Area	Fold change of Mass = Fold change of thickness * Fold change of Area	Fold change in size (square root of area fold change)	Plectrum Speed	radius)	Fold change in rotational speed =120 (since this is plectrum speed needed to excite a file with tooth spacing of 12microns at 20kHz)/scaled plectrum speed	Fold change in rotational energy	Tooth spacing	Scaled file spacing (assuming allometric scaling)	Fold change in stridulation energy (if tooth spacing becomes 12 microns from a larger spacing, more teeth need to be struck, proprtionately increasing the energy required for strudulation)
Gryllodes sp. T. portentosus	6.88	1.4 5.7	5.24 2.13		5.88 4.12	2	0.59	1.18 0.82	0.766812 0.641872	64.7 218	49.61270926 139.928153	2.42 0.86	0.61	22 106	16.86985477 68.03845971	1.4 5.7
G. bimaculatus	3.58	2.1			4.12	2		1.00	0.705691	89.7	63.30049621	1.00	3.58	36		3.7
o. Dimoculatus	3.00	2.1	5.14		4.50			ng Harn siz			asing thickness	1.50	3.30	30	25.40468142	2.1
Gryllodes sp.	7.02	1.4	5.34		5.88	2.04	060	1 22	0.774597	64.7	50.1164045	2.39	7.02	22	17.04112672	1.4
T. portentosus	0.88	6.8			4.12	2.91	0.60	1.75	0.774597	218	168.8620739	0.71	0.88	106	82.10724694	6.8
G. bimaculatus	4.31	2.3			4.98	2.41	0.60	1.45	0.774597	89.7	69.48132123	1.73	4.31	36		2.3
	To achieve a song frequency of 10kHz Decreasing Haro size, and increasing thickness 1.5 fold															
	Fold-change in rotational energy	Fold increase in stridulation energy	0.7*rotatio nal energy + 0.3*stridula tion energy			of thickness	Fold change of Area	Fold change of Mass = Fold change of thickness * Fold change of Area	Fold change in size (square root of area fold change)	Plectrum Speed	Scaled plectrum speed (due to scaled plectrum radius)	Fold change in rotational speed =60 (since this is plectrum speed needed to excite a file with tooth spacing of 12microns at 10kHz//scaled plectrum speed	Fold change in rotational energy	Tooth spacing	Scaled file spacing (assuming allometric scaling)	Fold change in stridulation energy (If tooth spacing becomes 12 microns from a larger spacing, more teeth need to be struck, proprtionately increasing the energy required for strudulation)
Gryllodes sp.	1.29	1.7	1.42		5.88 4.12	1.5	0.88	0.93	0.939149	64.7	60.76291122	0.99	1.29	22 106	20.66126811 83.32975459	1.7
T. portentosus G. bimaculatus	0.11	6.9			4.12	1.5		0.93	0.78613	218 89.7	171.3762877 77.52695809	0.35 0.77	0.11	106 36		6.9
G. bimaculatus																
Decreasing Harp size 0.75 fold, and increasing thickness																
Gulladas es	4.40	4.0	1.24		E 00	1 20	0.75	0.06	0.966035	647	56 02194262	1.07	1 10	22	10.05255000	4.6
Gryllodes sp.	1.10	1.6			5.88	1.28		0.96	0.866025	64.7	56.03184362 188 793538	1.07	1.10	22		1.6
Gryllodes sp. T. portentosus G. bimaculatus	1.10 0.14 0.67	1.6 7.6 2.6	2.39		5.88 4.12 4.98	1.28 1.82 1.51	0.75 0.75 0.75	0.96 1.37 1.13	0.866025 0.866025 0.866025	64.7 218 89.7	188.793538	1.07 0.32 0.77	1.10 0.14 0.67	22 106 36	91.7986928	1.6 7.6 2.6