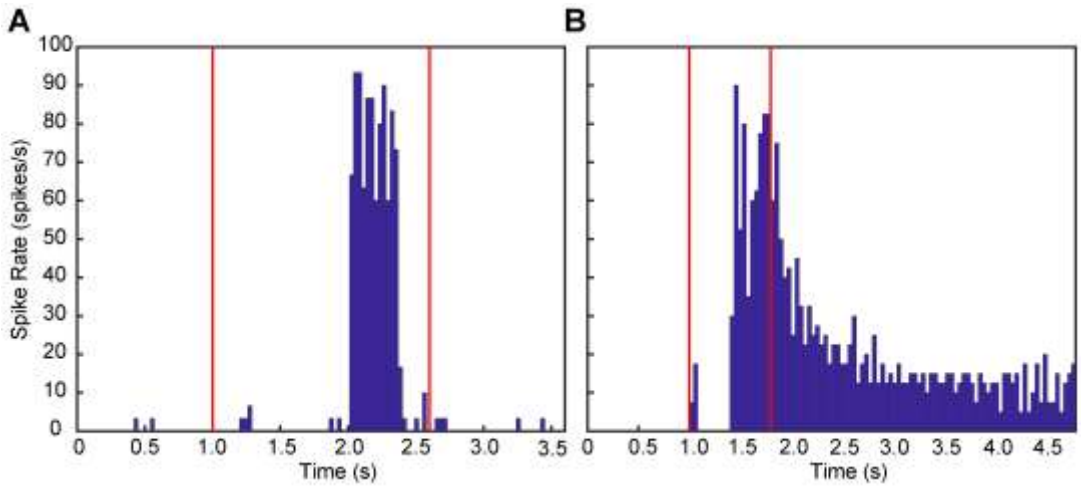

Fig S1. Temporal response profiles to a proximodistal brushing stimuli. (A) Poststimulus time histogram (PSTH, bin width 30 ms) from a representative afferent showing the mean firing rate across 10 trials to a proximodistal brushing stimuli moving across the fin surface at 5 mm/sec. The red vertical lines indicate the onset and offset of the stimulus. The temporal response profiles of units used in the analysis of receptive field size typically consisted of a prolonged period of sustained activity with a high spike rate bordered by periods of sparse or no firing. (B) PSTH (10 trials, bin width 40 ms) from a representative afferent that continued to fire well after the stimulus offset indicative of a slowly adapting response to the sustained indentation of the probe. The response is characterized by a sharp decrease in firing rate shortly after stimulus offset (rightmost red vertical line) followed by an extended period of tonic firing. When averaged across afferents (n = 4) and trials, the spike rate (spikes/s) during the period of prolonged indentation was 13.63 $\pm$ 3.71 (mean $\pm$ s.d.).

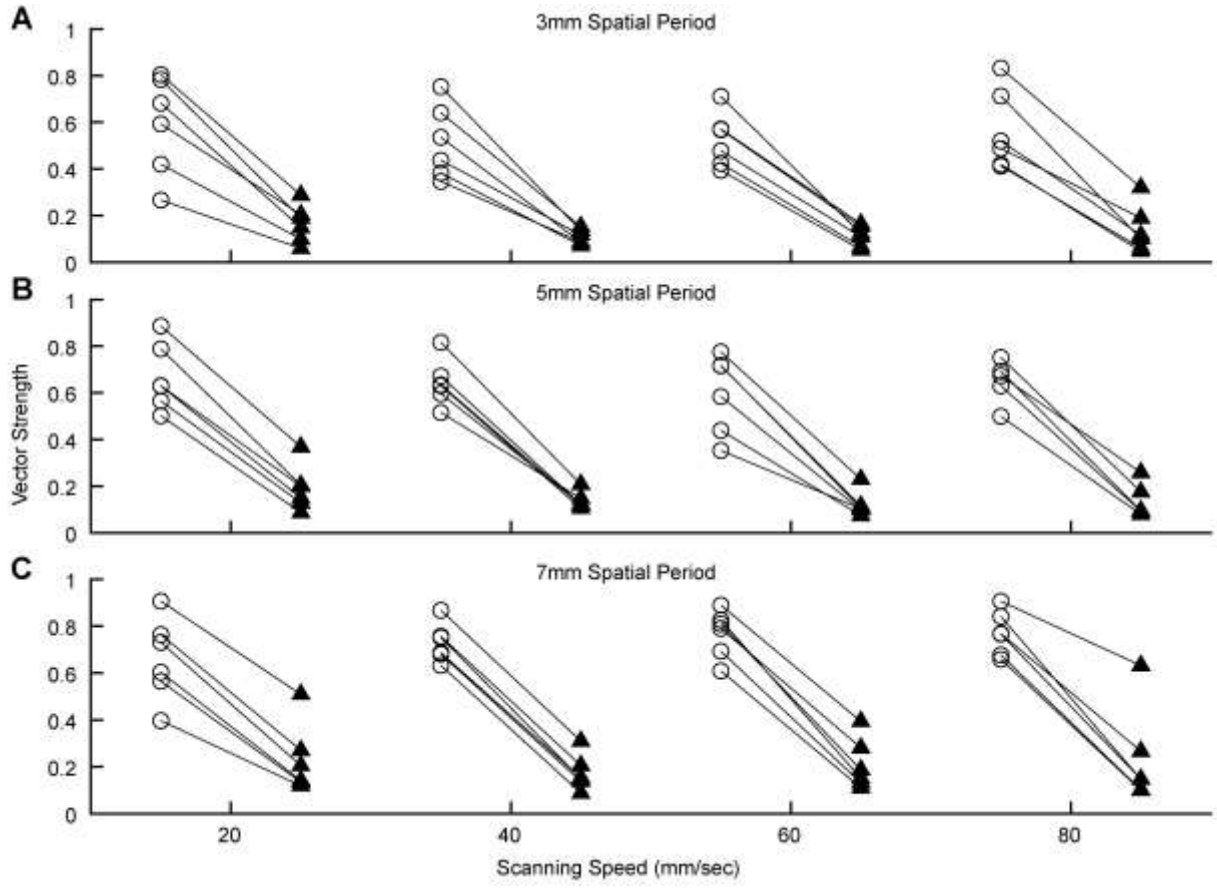

Fig S2. Comparison of vector strength between the observed and simulated afferent responses to the spatial period of coarse gratings. Vector strength, a measure of phase locking between a periodic stimulus and a neural response, ranges from 0 for uniform firing across all phases of the stimulus to 1 for perfectly synchronized firing at only one phase location relative to each passing stimulus. Each row of plots shows the vector strength of the observed and simulated response for each afferent (n = 6) to gratings with a (A) 3 mm, (B) 5 mm, or (C) 7 mm spatial period scanned across the fin at 20, 40, 60, or 80 mm/s. Open circles mark the observed mean (n = 5 trials) vector strength value for a given combination of grating spatial period and scanning speed. Filled triangles mark the simulated mean (n = 5 trials) vector strength value expected by chance if there was no cyclic entrainment (see Materials and Methods). Lines connect data points from a given afferent. Vector strength values for each combination of spatial period and scanning speed were significantly higher than expected by chance ($P < 0.001$). The high degree of phase locking provides precise information on the temporal frequency on coarse gratings independent of the grating spatial period or scanning speed.

Table S1. Summary data associated with response properties to tactile motion for each afferent (n = 8) include in the analysis of receptive field size. All values are presented as the mean ± standard deviation.

Afferent ID	Scanning Speed (mm/s)	Stimulus Evoked Spikes	Duration of Stimuls Evoked Activity (s)	Spike Rate (spikes/s)	Receptive Field Size (mm)
1	5	40.3 ± 2.54	0.660 ± 0.079	61.80 ± 8.07	3.30 ± 0.393
	10	28.5 ± 2.51	0.365 ± 0.027	78.23 ± 7.38	3.65 ± 0.270
	20	14.7 ± 2.16	0.214 ± 0.035	69.72 ± 11.62	4.27 ± 0.696
2	5	29.3 ± 2.50	0.434 ± 0.120	70.19 ± 11.72	2.17 ± 0.549
	10	15.7 ± 1.70	0.270 ± 0.041	59.01 ± 7.85	2.70 ± 0.411
	20	7.1 ± 1.37	0.100 ± 0.052	80.62 ± 23.94	2.00 ± 1.034
3	5	33.6 ± 5.80	1.088 ± 0.062	30.84 ± 4.69	5.44 ± 0.311
	10	19.0 ± 3.16	0.515 ± 0.055	37.22 ± 6.69	5.15 ± 0.554
	20	10.2 ± 1.40	0.224 ± 0.027	45.72 ± 5.22	4.48 ± 0.538
4	5	38.4 ± 2.32	0.831 ± 0.029	46.26 ± 3.16	4.15 ± 0.147
	10	19.3 ± 1.34	0.395 ± 0.027	49.02 ± 3.75	3.95 ± 0.276
	20	13.0 ± 1.41	0.174 ± 0.031	76.02 ± 9.12	3.48 ± 0.622
5	5	52.1 ± 5.51	0.872 ± 0.027	59.68 ± 5.23	4.36 ± 0.136
	10	23.7 ± 2.31	0.469 ± 0.011	50.51 ± 4.40	4.69 ± 0.112
	20	14.4 ± 1.51	0.231 ± 0.011	62.26 ± 6.07	4.63 ± 0.234
6	5	44.5 ± 2.80	0.798 ± 0.016	55.76 ± 3.42	3.99 ± 0.079
	10	18.9 ± 2.33	0.403 ± 0.031	47.03 ± 5.43	4.03 ± 0.314
	20	14.0 ± 1.33	0.242 ± 0.024	58.21 ± 7.33	4.85 ± 0.485
7	5	28.1 ± 3.28	0.525 ± 0.020	53.59 ± 6.59	2.63 ± 0.102
	10	15.8 ± 2.94	0.264 ± 0.079	61.90 ± 12.19	2.64 ± 0.788
	20	11.7 ± 1.89	0.183 ± 0.062	68.08 ± 15.85	3.67 ± 1.243
8	5	45.9 ± 7.36	0.824 ± 0.012	55.67 ± 8.95	4.12 ± 0.061
	10	35.4 ± 5.76	0.408 ± 0.012	86.79 ± 13.53	4.08 ± 0.127
	20	10.7 ± 1.70	0.208 ± 0.032	51.95 ± 8.20	4.16 ± 0.648