

Additional file 1: Supplementary Tables

Table S1. Information on whole-embryo ATAC-seq samples.

Species	Developmental stage	Biological replicate number	Number of embryos pooled	Number of cells for ATAC-seq	Filtered reads	
Mouse	E7.5	1	16	50,000	163,806,138	
	E7.5	2	18	50,000	150,590,012	
	E7.5	3	15	50,000	123,878,902	
	E8.5	1	15	50,000	146,637,870	
	E8.5	2	6	50,000	160,013,422	
	E8.5	3	14	50,000	139,587,780	
	E9.5	1	6	500,000	133,768,752	
	E9.5	2	15	500,000	152,951,300	
	E9.5	3	6	500,000	138,861,218	
	E10.5	1	6	500,000	152,238,300	
	E10.5	2	8	500,000	149,835,156	
	E10.5	3	8	500,000	141,327,110	
	E12.5	1	2	500,000	143,046,480	
	E12.5	2	2	500,000	139,967,892	
	E12.5	3	2	500,000	172,080,896	
	E14.5	1	2	500,000	148,176,792	
	E14.5	2	2	500,000	139,462,932	
	E14.5	3	2	500,000	139,744,522	
	E16.5	1	2	500,000	137,658,622	
	E16.5	2	2	500,000	161,752,784	
	E16.5	3	2	500,000	121,824,564	
	E18.5	1	2	500,000	147,274,838	
	E18.5	2	2	500,000	171,704,282	
	E18.5	3	2	500,000	168,567,462	
	Chicken	HH6	1	5	500,000	150,293,014
		HH6	2	4	500,000	160,558,314
		HH6	3	4	500,000	144,524,764
		HH11	1	5	500,000	133,312,472
		HH11	2	5	500,000	129,538,096
		HH11	3	4	500,000	135,804,384
HH16		1	7	500,000	136,976,744	
HH16		2	7	500,000	138,557,562	
HH16		3	7	500,000	129,294,694	
HH19		1	4	500,000	131,750,406	
HH19		2	4	500,000	152,140,888	
HH19		3	4	500,000	158,072,072	
HH24		1	2	500,000	139,759,998	
HH24		2	2	500,000	137,259,058	
HH24		3	2	500,000	152,682,324	
HH28		1	2	500,000	124,272,006	
HH28		2	2	500,000	116,448,198	
HH28		3	2	500,000	122,776,106	
HH32		1	2	500,000	142,818,500	
HH32		2	2	500,000	145,458,928	
HH32		3	2	500,000	157,787,170	
HH38	1	2	500,000	156,110,422		
HH38	2	2	500,000	142,826,992		
HH38	3	2	500,000	148,502,578		
Medaka	Stage 15	1	73	50,000	146,821,406	

Stage 15	2	74	50,000	122,253,936
Stage 15	3	73	50,000	111,469,822
Stage 21	1	40	50,000	315,598,798
Stage 21	2	30	50,000	218,284,158
Stage 21	3	37	50,000	303,105,284
Stage 24	1	66	500,000	185,387,768
Stage 24	2	40	500,000	214,447,928
Stage 24	3	40	500,000	201,949,114
Stage 28	1	30	500,000	136,739,522
Stage 28	2	30	500,000	134,723,176
Stage 28	3	37	500,000	143,599,588
Stage 32	1	20	500,000	149,691,470
Stage 32	2	24	500,000	120,335,888
Stage 32	3	19	500,000	153,597,756
Stage 36	1	17	500,000	123,633,866
Stage 36	2	24	500,000	86,787,606
Stage 36	3	17	500,000	169,536,716
Stage 40	1	9	500,000	116,558,148
Stage 40	2	3	500,000	197,537,256
Stage 40	3	6	500,000	138,102,580

Table S2. Numbers of ACRs at each developmental stage.

Species	Developmental stage	Number of ACRs
Mouse	E7.5	159,511
	E8.5	220,908
	E9.5	226,497
	E10.5	232,539
	E12.5	258,350
	E14.5	232,001
	E16.5	234,434
	E18.5	263,158
Chicken	HH6	292,196
	HH11	297,167
	HH16	302,889
	HH19	310,539
	HH24	329,279
	HH28	342,874
	HH32	354,700
	HH38	304,751
Medaka	Stage 15	191,151
	Stage 21	200,464
	Stage 24	214,908
	Stage 28	199,302
	Stage 32	213,963
	Stage 36	211,107
	Stage 40	187,170

Table S3. FRiP score of whole-embryo ATAC-seq data.

Species	Developmental stage	FRiP score*
Mouse	E7.5	0.264
	E8.5	0.393
	E9.5	0.366
	E10.5	0.405
	E12.5	0.386
	E14.5	0.313
	E16.5	0.264
	E18.5	0.201
Chicken	HH6	0.274
	HH11	0.354
	HH16	0.530
	HH19	0.539
	HH24	0.470
	HH28	0.418
	HH32	0.412
	HH38	0.301
Medaka	Stage 15	0.279
	Stage 21	0.274
	Stage 24	0.374
	Stage 28	0.430
	Stage 32	0.454
	Stage 36	0.472
	Stage 40	0.383

*The FRiP score is a genome-wide, quality metric of the signal-to-background ratio, and it is defined as a fraction of all aligned reads in the called peak regions [62]. According to the quality standard defined by the ENCODE consortium [63], the ATAC-seq data with >0.2 FRiP scores are acceptable.

Table S4. The numbers of ACRs at promoters and the two-sided Fisher's exact test.

Species	ACRs		Random regions		Two-sided Fisher's exact test (<i>P</i>)
	in promoters	outside of promoters	in promoters	outside of promoters	
Mouse	81,245	656,850	37,253	700,842	$< 2.2 \times 10^{-16}$
Chicken	45,480	753,032	35,867	762,645	$< 2.2 \times 10^{-16}$
Medaka	53,411	393,986	32,273	415,124	$< 2.2 \times 10^{-16}$

Table S5. Biological reproducibility of whole-embryo ATAC-seq signal intensities.

Species	Stage	Pair compared	Pearson correlation coefficient (r)	T of test for no correlation	P value
Mouse	E7.5	Rep. 1 vs Rep. 2	0.859	668.907	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.855	658.630	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.905	847.750	$< 2.2 \times 10^{-16}$
	E8.5	Rep. 1 vs Rep. 2	0.903	989.000	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.908	1018.322	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.891	924.761	$< 2.2 \times 10^{-16}$
	E9.5	Rep. 1 vs Rep. 2	0.891	932.351	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.886	907.021	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.901	986.235	$< 2.2 \times 10^{-16}$
	E10.5	Rep. 1 vs Rep. 2	0.909	1052.135	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.898	985.457	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.911	1067.454	$< 2.2 \times 10^{-16}$
	E12.5	Rep. 1 vs Rep. 2	0.897	1028.852	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.901	1053.518	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.891	994.911	$< 2.2 \times 10^{-16}$
	E14.5	Rep. 1 vs Rep. 2	0.900	992.272	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.903	1009.557	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.899	986.149	$< 2.2 \times 10^{-16}$
	E16.5	Rep. 1 vs Rep. 2	0.895	969.709	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.892	953.606	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.898	988.806	$< 2.2 \times 10^{-16}$
	E18.5	Rep. 1 vs Rep. 2	0.846	812.949	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.849	823.157	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.850	829.223	$< 2.2 \times 10^{-16}$
Chicken	HH6	Rep. 1 vs Rep. 2	0.884	1023.111	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.881	1005.550	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.883	1018.269	$< 2.2 \times 10^{-16}$
	HH11	Rep. 1 vs Rep. 2	0.912	1208.464	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.899	1120.904	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.899	1118.204	$< 2.2 \times 10^{-16}$
	HH16	Rep. 1 vs Rep. 2	0.923	1320.017	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.924	1329.981	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.924	1325.296	$< 2.2 \times 10^{-16}$
	HH19	Rep. 1 vs Rep. 2	0.927	1379.717	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.926	1368.087	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.930	1410.105	$< 2.2 \times 10^{-16}$
	HH24	Rep. 1 vs Rep. 2	0.912	1274.164	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.901	1191.306	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.911	1267.540	$< 2.2 \times 10^{-16}$
	HH28	Rep. 1 vs Rep. 2	0.906	1251.740	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.908	1270.402	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.906	1253.564	$< 2.2 \times 10^{-16}$
	HH32	Rep. 1 vs Rep. 2	0.910	1308.219	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.908	1288.459	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.906	1273.837	$< 2.2 \times 10^{-16}$
	HH38	Rep. 1 vs Rep. 2	0.897	1121.290	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.899	1134.043	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.903	1158.655	$< 2.2 \times 10^{-16}$
Medaka	Stage 15	Rep. 1 vs Rep. 2	0.906	933.672	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.907	940.531	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.906	935.824	$< 2.2 \times 10^{-16}$
	Stage 21	Rep. 1 vs Rep. 2	0.911	991.763	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.911	987.852	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.909	979.181	$< 2.2 \times 10^{-16}$
	Stage 24	Rep. 1 vs Rep. 2	0.872	825.500	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.874	834.035	$< 2.2 \times 10^{-16}$
		Rep. 2 vs Rep. 3	0.931	1179.750	$< 2.2 \times 10^{-16}$
	Stage 28	Rep. 1 vs Rep. 2	0.929	1122.782	$< 2.2 \times 10^{-16}$
		Rep. 1 vs Rep. 3	0.928	1115.674	$< 2.2 \times 10^{-16}$

	Rep. 2 vs Rep. 3	0.924	1081.386	$< 2.2 \times 10^{-16}$
Stage 32	Rep. 1 vs Rep. 2	0.928	1156.388	$< 2.2 \times 10^{-16}$
	Rep. 1 vs Rep. 3	0.924	1117.229	$< 2.2 \times 10^{-16}$
	Rep. 2 vs Rep. 3	0.915	1051.375	$< 2.2 \times 10^{-16}$
Stage 36	Rep. 1 vs Rep. 2	0.929	1157.204	$< 2.2 \times 10^{-16}$
	Rep. 1 vs Rep. 3	0.935	1206.773	$< 2.2 \times 10^{-16}$
	Rep. 2 vs Rep. 3	0.931	1171.902	$< 2.2 \times 10^{-16}$
Stage 40	Rep. 1 vs Rep. 2	0.898	883.883	$< 2.2 \times 10^{-16}$
	Rep. 1 vs Rep. 3	0.901	899.696	$< 2.2 \times 10^{-16}$
	Rep. 2 vs Rep. 3	0.917	993.256	$< 2.2 \times 10^{-16}$

Table S6. Information on whole-genome pairwise alignment data.

Reference species	Reference genome version	Query species	Query genome version	Parameter for axtChain
Mouse (<i>Mus musculus</i>)	GRCm38	Rat (<i>Rattus norvegicus</i>)	Rnor_6.0	-minScore=3000 -linearGap=medium
Mouse (<i>Mus musculus</i>)	GRCm38	Rabbit (<i>Oryctolagus cuniculus</i>)	OryCun2.0	-minScore=3000 -linearGap=medium
Mouse (<i>Mus musculus</i>)	GRCm38	Human (<i>Homo sapiens</i>)	GRCh38	-minScore=3000 -linearGap=medium
Mouse (<i>Mus musculus</i>)	GRCm38	Cow (<i>Bos taurus</i>)	UMD3.1	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Opossum (<i>Monodelphis domestica</i>)	monDom5	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Western clawed frog (<i>Xenopus tropicalis</i>)	JGI_4.2	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Coelacanth (<i>Latimeria chalumnae</i>)	LatCha1	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Spotted gar (<i>Lepisosteus oculatus</i>)	LepOcu1	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Elephant shark (<i>Callorhynchus milii</i>)	calMil1	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Lamprey (<i>Petromyzon marinus</i>)	Pmarinus_7.0	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Vase tunicate (<i>Ciona intestinalis</i>)	KH	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Amphioxus (<i>Branchiostoma floridae</i>)	v1.0	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Roundworm (<i>Caenorhabditis elegans</i>)	WBcel235	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Starlet sea anemone (<i>Nematostella vectensis</i>)	ASM20922v1	-minScore=5000 -linearGap=loose
Mouse (<i>Mus musculus</i>)	GRCm38	Choanoflagellate (<i>Salpingoeca rosetta</i>)	Proterospongia_sp_ATCC50818	-minScore=5000 -linearGap=loose
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	Turkey (<i>Meleagris gallopavo</i>)	UMD2	-minScore=3000 -linearGap=medium
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	Zebra finch (<i>Taeniopygia guttata</i>)	taeGut3.2.4	-minScore=3000 -linearGap=medium
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	American alligator (<i>Alligator mississippiensis</i>)	ASM28112v4	-minScore=5000 -linearGap=loose
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	Softshell turtle (<i>Pelodiscus sinensis</i>)	PelSin_1.0	-minScore=5000 -linearGap=loose
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	Anole lizard (<i>Anolis carolinensis</i>)	AnoCar2.0	-minScore=5000 -linearGap=loose
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	Mouse (<i>Mus musculus</i>)	GRCm38	-minScore=5000 -linearGap=loose
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	Western clawed frog (<i>Xenopus tropicalis</i>)	JGI_4.2	-minScore=5000 -linearGap=loose
Chicken (<i>Gallus gallus</i>)	Gallus_gallus-5.0	Coelacanth	LatCha1	-minScore=5000

(<i>Gallus gallus</i>)		(<i>Latimeria chalumnae</i>)		-linearGap=loose
Chicken		Spotted gar		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Lepisosteus oculatus</i>)	LepOcu1	-linearGap=loose
Chicken		Elephant shark		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Callorhinchus milii</i>)	calMil1	-linearGap=loose
Chicken		Lamprey		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Petromyzon marinus</i>)	Pmarinus_7.0	-linearGap=loose
Chicken		Vase tunicate		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Ciona intestinalis</i>)	KH	-linearGap=loose
Chicken		Amphioxus		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Branchiostoma floridae</i>)	v1.0	-linearGap=loose
Chicken		Roundworm		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Caenorhabditis elegans</i>)	WBcel235	-linearGap=loose
Chicken		Starlet sea anemone		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Nematostella vectensis</i>)	ASM20922v1	-linearGap=loose
Chicken		Choanoflagellate		-minScore=5000
(<i>Gallus gallus</i>)	Gallus_gallus-5.0	(<i>Salpingoeca rosetta</i>)	sp_ATCC50818	-linearGap=loose
Medaka		Amazon molly		-minScore=3000
(<i>Oryzias latipes</i>)	HdrR	(<i>Poecilia formosa</i>)	PoeFor_5.1.2	-linearGap=medium
Medaka		Tilapia		-minScore=3000
(<i>Oryzias latipes</i>)	HdrR	(<i>Oreochromis niloticus</i>)	Orenil1.0	-linearGap=medium
Medaka		Fugu		-minScore=3000
(<i>Oryzias latipes</i>)	HdrR	(<i>Takifugu rubripes</i>)	FUGU 4.0	-linearGap=medium
Medaka		Mudskipper		-minScore=3000
(<i>Oryzias latipes</i>)	HdrR	(<i>Boleophthalmus pectinirostris</i>)	BP	-linearGap=medium
Medaka		Zebrafish		-minScore=3000
(<i>Oryzias latipes</i>)	HdrR	(<i>Danio rerio</i>)	GRCz10	-linearGap=medium
Medaka		Spotted gar		-minScore=3000
(<i>Oryzias latipes</i>)	HdrR	(<i>Lepisosteus oculatus</i>)	LepOcu1	-linearGap=medium
Medaka		Coelacanth		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Latimeria chalumnae</i>)	LatCha1	-linearGap=loose
Medaka		Elephant shark		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Callorhinchus milii</i>)	calMil1	-linearGap=loose
Medaka		Lamprey		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Petromyzon marinus</i>)	Pmarinus_7.0	-linearGap=loose
Medaka		Vase tunicate		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Ciona intestinalis</i>)	KH	-linearGap=loose
Medaka		Amphioxus		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Branchiostoma floridae</i>)	v1.0	-linearGap=loose
Medaka		Roundworm		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Caenorhabditis elegans</i>)	WBcel235	-linearGap=loose
Medaka		Starlet sea anemone		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Nematostella vectensis</i>)	ASM20922v1	-linearGap=loose
Medaka		Choanoflagellate		-minScore=5000
(<i>Oryzias latipes</i>)	HdrR	(<i>Salpingoeca rosetta</i>)	sp_ATCC50818	-linearGap=loose

Table S7. Statistical information in Figure 3.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	17.0	7	0.0175	0.0191	
	Human	17.8	7	0.0128	0.0191	
	Cow	16.6	7	0.0204	0.0204	
	Opossum	18.8	7	0.0088	0.0175	
	Chicken	20.4	7	0.0047	0.0150	
	Western clawed frog	20.2	7	0.0052	0.0150	
	Coelacanth	20.4	7	0.0048	0.0150	
	Spotted gar	18.1	7	0.0113	0.0191	
	Elephant shark	19.7	7	0.0063	0.0150	
	Lamprey	17.4	7	0.0150	0.0191	
	Vase tunicate	17.1	7	0.0170	0.0191	
	Amphioxus	20.7	7	0.0043	0.0150	
	Chicken	Chicken	18.2	7	0.0110	0.0130
		Turkey	14.5	7	0.0429	0.0429
American alligator		21.7	7	0.0029	0.0054	
Softshell turtle		20.8	7	0.0041	0.0067	
Anole lizard		21.7	7	0.0028	0.0054	
Mouse		22.3	7	0.0023	0.0054	
Western clawed frog		22.0	7	0.0026	0.0054	
Coelacanth		21.7	7	0.0029	0.0054	
Spotted gar		22.0	7	0.0025	0.0054	
Elephant shark		21.9	7	0.0027	0.0054	
Lamprey		17.4	7	0.0149	0.0161	
Vase tunicate		19.1	7	0.0079	0.0103	
Amphioxus		19.6	7	0.0065	0.0094	
Medaka		Medaka	16.7	6	0.0105	0.0144
	Amazon molly	18	6	0.0063	0.0124	
	Tilapia	17.8	6	0.0068	0.0124	
	Fugu	17.4	6	0.0079	0.0124	
	Zebrafish	16	6	0.0139	0.0170	
	Spotted gar	14.5	6	0.0244	0.0268	
	Coelacanth	17.7	6	0.0070	0.0124	
	Elephant shark	19.6	6	0.0032	0.0124	
	Lamprey	18	6	0.0062	0.0124	
	Vase tunicate	8.85	6	0.1820	0.1820	
Amphioxus	19.6	6	0.0032	0.0124		

Table S8. Statistical information in Figure 4.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	36.7	16	0.0023	0.0252	
	Human	24.3	16	0.0836	0.0912	
	Cow	28.2	16	0.0302	0.0497	
	Opossum	27.2	16	0.0390	0.0520	
	Chicken	27.8	16	0.0331	0.0497	
	Western clawed frog	25.5	16	0.0622	0.0746	
	Coelacanth	33.5	16	0.0063	0.0252	
	Spotted gar	32.2	16	0.0094	0.0282	
	Elephant shark	30.3	16	0.0165	0.0396	
	Lamprey	19.8	16	0.2300	0.2300	
	Vase tunicate	29.1	16	0.0234	0.0468	
	Amphioxus	33.7	16	0.0059	0.0252	
	Chicken	Chicken	15.6	12	0.2110	0.2286
		Turkey	22.4	12	0.0333	0.1092
American alligator		21.6	12	0.0420	0.1092	
Softshell turtle		23.0	12	0.0278	0.1092	
Anole lizard		22.1	12	0.0366	0.1092	
Mouse		16.5	12	0.1680	0.2184	
Western clawed frog		15.8	12	0.2000	0.2286	
Coelacanth		19.4	12	0.0793	0.1289	
Spotted gar		20.2	12	0.0630	0.1289	
Elephant shark		22.5	12	0.0320	0.1092	
Lamprey		12.2	12	0.4320	0.4320	
Vase tunicate		19.7	12	0.0738	0.1289	
Amphioxus		18.0	12	0.1160	0.1676	
Medaka		Medaka	20.8	15	0.1440	0.1760
	Amazon molly	30.1	15	0.0117	0.0429	
	Tilapia	21.5	15	0.1220	0.1678	
	Fugu	22.7	15	0.0897	0.1645	
	Zebrafish	21.5	15	0.1200	0.1678	
	Spotted gar	18.3	15	0.2450	0.2450	
	Coelacanth	27.7	15	0.0237	0.0652	
	Elephant shark	43.1	15	0.0001	0.0011	
	Lamprey	25.2	15	0.0476	0.1047	
	Vase tunicate	19.9	15	0.1760	0.1936	
	Amphioxus	31.7	15	0.0072	0.0396	

Table S9. Detailed information on representative enhancers from the VISTA Enhancer Database.

Enhancer ID	Genomic position (GRCm38)	Flanking genes	Expression pattern
mm3	12:111142738–111143613	<i>Rcor1</i> ; <i>Traf3</i>	neuraltube[4/4]; hindbrain(rhombencephalon)[4/4]; forebrain[4/4]
mm7	14:61004739–61005741	<i>Tnfrsf19</i>	forebrain[6/6]
mm9	8:46770571–46772246	<i>Irf2</i>	eye[3/4]
mm109	18:56896918–56898991	<i>March3</i>	heart[3/11]
mm257	18:75502363–75503667	<i>Ctif</i>	midbrain(mesencephalon)[6/8]; heart[8/8]
mm303	9:103679109–103679657	<i>4932413F04Rik</i> ; <i>Nphp3</i>	heart[3/6]
mm324	19:47908459–47910596	<i>Itpr1p</i>	nose[4/11]
mm394	5:24730554–24731843	<i>Wdr86</i> ; <i>Crygn</i>	midbrain(mesencephalon)[6/11]; eye[5/11]
mm422	2:4556144–4557875	<i>Frm4a</i>	forebrain[4/7]; limb[4/7]
mm515	2:75422202–75424576	<i>Mtx2</i> ; <i>9430019J16Rik</i>	neuraltube[4/7]; hindbrain(rhombencephalon)[5/7]; forebrain[4/7]; limb[5/7]
mm622	5:111601262–111602739	<i>C130026L21Rik</i> ; <i>E130006D01Rik</i>	branchialarch[9/11]
mm790	1:127554365–127556879	<i>Tmem163</i>	neuraltube[3/3]; hindbrain(rhombencephalon)[3/3]; midbrain(mesencephalon)[3/3]; forebrain[3/3]

Table S10. Statistical information in Figure S7.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	36.7	16	0.0023	0.0275	
	Human	24.8	16	0.0743	0.0991	
	Cow	30.4	16	0.0160	0.0410	
	Opossum	29.5	16	0.0206	0.0412	
	Chicken	27.8	16	0.0331	0.0567	
	Western clawed frog	23.6	16	0.0989	0.1187	
	Coelacanth	34.3	16	0.0050	0.0298	
	Spotted gar	20.8	16	0.1870	0.2040	
	Elephant shark	27.3	16	0.0384	0.0576	
	Lamprey	14.9	16	0.5320	0.5320	
	Vase tunicate	30.2	16	0.0171	0.0410	
	Amphioxus	32.5	16	0.0087	0.0348	
	Chicken	Chicken	15.5	12	0.2160	0.2470
		Turkey	22.2	12	0.0349	0.1144
American alligator		21.6	12	0.0420	0.1144	
Softshell turtle		22.1	12	0.0366	0.1144	
Anole lizard		20.3	12	0.0618	0.1144	
Mouse		14.9	12	0.2470	0.2470	
Western clawed frog		21.2	12	0.0471	0.1144	
Coelacanth		18.3	12	0.1080	0.1560	
Spotted gar		19.8	12	0.0704	0.1144	
Elephant shark		19.9	12	0.0687	0.1144	
Lamprey		14.9	12	0.2460	0.2470	
Vase tunicate		20.4	12	0.0603	0.1144	
Amphioxus		16.5	12	0.1680	0.2184	
Medaka		Medaka	18.9	15	0.2170	0.2170
	Amazon molly	27.4	15	0.0257	0.0707	
	Tilapia	23.8	15	0.0691	0.1267	
	Fugu	21.5	15	0.1220	0.1678	
	Zebrafish	19.1	15	0.2110	0.2170	
	Spotted gar	22	15	0.1080	0.1678	
	Coelacanth	20.9	15	0.1390	0.1699	
	Elephant shark	43.7	15	0.0001	0.0013	
	Lamprey	24.7	15	0.0535	0.1177	
	Vase tunicate	32.1	15	0.0063	0.0231	
	Amphioxus	32.3	15	0.0059	0.0231	

Table S11. Statistical information in Figure S8a.

		Kruskal–Wallis rank sum test				
Species	Category	Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	17.0	7	0.0175	0.0210	
	Human	17.9	7	0.0124	0.0201	
	Cow	16.6	7	0.0022	0.0178	
	Opossum	19.3	7	0.0074	0.0178	
	Chicken	19.4	7	0.0071	0.0178	
	Western clawed frog	15.1	7	0.0350	0.0382	
	Coelacanth	19.8	7	0.0060	0.0178	
	Spotted gar	12.5	7	0.0847	0.0847	
	Elephant shark	18.6	7	0.0097	0.0194	
	Lamprey	17.4	7	0.0151	0.0201	
	Vase tunicate	17.5	7	0.0147	0.0201	
	Amphioxus	20.6	7	0.0043	0.0178	
	Chicken	Chicken	19.8	7	0.0061	0.0079
		Turkey	19.0	7	0.0082	0.0089
American alligator		22.0	7	0.0026	0.0055	
Softshell turtle		21.3	7	0.0034	0.0055	
Anole lizard		21.4	7	0.0033	0.0055	
Mouse		21.3	7	0.0034	0.0055	
Western clawed frog		21.2	7	0.0035	0.0055	
Coelacanth		21.6	7	0.0029	0.0055	
Spotted gar		21.2	7	0.0035	0.0055	
Elephant shark		22.2	7	0.0024	0.0055	
Lamprey		17.5	7	0.0143	0.0143	
Vase tunicate		19.1	7	0.0077	0.0089	
Amphioxus		21.0	7	0.0038	0.0055	
Medaka		Medaka	17.3	6	0.0083	0.0156
	Amazon molly	16.8	6	0.0099	0.0156	
	Tilapia	17.5	6	0.0075	0.0156	
	Fugu	17.1	6	0.0088	0.0156	
	Zebrafish	15.7	6	0.0154	0.0212	
	Spotted gar	14	6	0.0297	0.0363	
	Coelacanth	19.5	6	0.0034	0.0136	
	Elephant shark	19.6	6	0.0032	0.0136	
	Lamprey	9.85	6	0.1310	0.1441	
	Vase tunicate	8.76	6	0.1870	0.1870	
	Amphioxus	19.3	6	0.0037	0.0136	

Table S12. Statistical information in Figure S8b.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	17.1	7	0.0167	0.0182	
	Human	17.1	7	0.0167	0.0182	
	Cow	17.1	7	0.0167	0.0182	
	Opossum	18.5	7	0.0099	0.0164	
	Chicken	20.2	7	0.0051	0.0146	
	Western clawed frog	18.5	7	0.0100	0.0164	
	Coelacanth	20.2	7	0.0051	0.0146	
	Spotted gar	20.2	7	0.0051	0.0146	
	Elephant shark	19.7	7	0.0061	0.0146	
	Lamprey	18.3	7	0.0109	0.0164	
	Vase tunicate	15.6	7	0.0286	0.0286	
	Amphioxus	20.9	7	0.0039	0.0146	
	Chicken	Chicken	18.8	7	0.0087	0.0126
		Turkey	17.7	7	0.0136	0.0153
American alligator		22.7	7	0.0019	0.0056	
Softshell turtle		20.5	7	0.0046	0.0075	
Anole lizard		21.7	7	0.0029	0.0056	
Mouse		22.4	7	0.0022	0.0056	
Western clawed frog		21.6	7	0.0030	0.0056	
Coelacanth		21.9	7	0.0026	0.0056	
Spotted gar		21.6	7	0.0030	0.0056	
Elephant shark		21.7	7	0.0028	0.0056	
Lamprey		17.6	7	0.0141	0.0153	
Vase tunicate		18.3	7	0.0108	0.0140	
Amphioxus		17.3	7	0.0154	0.0154	
Medaka		Medaka	17.2	6	0.0087	0.0131
	Amazon molly	16.4	6	0.0119	0.0131	
	Tilapia	18.1	6	0.0059	0.0131	
	Fugu	17.2	6	0.0087	0.0131	
	Zebrafish	16.5	6	0.0112	0.0131	
	Spotted gar	13.7	6	0.0334	0.0334	
	Coelacanth	16.7	6	0.0106	0.0131	
	Elephant shark	19.6	6	0.0032	0.0131	
	Lamprey	17.6	6	0.0072	0.0131	
	Vase tunicate	19	6	0.0041	0.0131	
	Amphioxus	19.6	6	0.0032	0.0131	

Table S13. Statistical information in Figure S8c.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	17.4	7	0.0150	0.0200	
	Human	17.4	7	0.0148	0.0200	
	Cow	16.6	7	0.0204	0.0245	
	Opossum	18.5	7	0.0098	0.0200	
	Chicken	18.9	7	0.0086	0.0200	
	Western clawed frog	20.5	7	0.0047	0.0200	
	Coelacanth	19.6	7	0.0066	0.0200	
	Spotted gar	13.1	7	0.0705	0.0705	
	Elephant shark	17.8	7	0.0130	0.0200	
	Lamprey	18.3	7	0.0109	0.0200	
	Vase tunicate	16.1	7	0.0243	0.0265	
	Amphioxus	19.9	7	0.0058	0.0200	
	Chicken	Chicken	20.2	7	0.0052	0.0068
		Turkey	18.8	7	0.0087	0.0094
American alligator		22.7	7	0.0019	0.0062	
Softshell turtle		20.7	7	0.0043	0.0062	
Anole lizard		21.1	7	0.0036	0.0062	
Mouse		21.5	7	0.0031	0.0062	
Western clawed frog		21.1	7	0.0036	0.0062	
Coelacanth		21.4	7	0.0033	0.0062	
Spotted gar		21.8	7	0.0028	0.0062	
Elephant shark		22.0	7	0.0025	0.0062	
Lamprey		18.0	7	0.0121	0.0121	
Vase tunicate		19.0	7	0.0081	0.0094	
Amphioxus		20.7	7	0.0042	0.0062	
Medaka		Medaka	17.7	6	0.0069	0.0150
	Amazon molly	16.4	6	0.0117	0.0169	
	Tilapia	17.7	6	0.0071	0.0150	
	Fugu	17.3	6	0.0082	0.0150	
	Zebrafish	16.3	6	0.0123	0.0169	
	Spotted gar	15	6	0.0206	0.0252	
	Coelacanth	19.6	6	0.0032	0.0143	
	Elephant shark	19.4	6	0.0036	0.0143	
	Lamprey	10.6	6	0.1030	0.1133	
	Vase tunicate	8.81	6	0.1840	0.1840	
	Amphioxus	19.1	6	0.0039	0.0143	

Table S14. Statistical information in Figure S9.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	22.3	7	0.0023	0.0119	
	Rat	17.7	7	0.0136	0.0193	
	Rabbit	16.2	7	0.0236	0.0267	
	Human	14.3	7	0.0464	0.0464	
	Cow	16.3	7	0.0225	0.0267	
	Opossum	19.5	7	0.0067	0.0121	
	Chicken	21.4	7	0.0032	0.0119	
	Western clawed frog	20.8	7	0.0041	0.0119	
	Coelacanth	21.3	7	0.0034	0.0119	
	Spotted gar	19.0	7	0.0082	0.0127	
	Elephant shark	20.7	7	0.0042	0.0119	
	Lamprey	16.4	7	0.0220	0.0267	
	Vase tunicate	15.7	7	0.0285	0.0303	
	Amphioxus	19.4	7	0.0071	0.0121	
	Roundworm	19.6	7	0.0064	0.0121	
	Starlet sea anemone	19.9	7	0.0058	0.0121	
	Choanoflagellates	21.7	7	0.0029	0.0119	
	Chicken	Chicken	18.4	7	0.0101	0.0114
		Turkey	20.4	7	0.0048	0.0077
Zebra finch		12.3	7	0.0909	0.0909	
American alligator		20.9	7	0.0039	0.0077	
Softshell turtle		21.3	7	0.0033	0.0077	
Anole lizard		21.5	7	0.0031	0.0077	
Mouse		22.1	7	0.0024	0.0077	
Western clawed frog		22.5	7	0.0021	0.0077	
Coelacanth		21.9	7	0.0027	0.0077	
Spotted gar		21.5	7	0.0031	0.0077	
Elephant shark		22.1	7	0.0024	0.0077	
Lamprey		17.5	7	0.0147	0.0156	
Vase tunicate		18.6	7	0.0096	0.0114	
Amphioxus		20.1	7	0.0054	0.0077	
Roundworm		20.5	7	0.0046	0.0077	
Starlet sea anemone		18.9	7	0.0084	0.0110	
Choanoflagellates		20.3	7	0.0050	0.0077	
Medaka		Medaka	16.7	6	0.0103	0.0129
		Amazon molly	18.0	6	0.0063	0.0102
	Tilapia	17.5	6	0.0075	0.0102	
	Fugu	17.7	6	0.0070	0.0102	
	Mudskipper	17.6	6	0.0074	0.0102	
	Zebrafish	15.1	6	0.0198	0.0228	
	Spotted gar	14.0	6	0.0295	0.0295	
	Coelacanth	17.9	6	0.0065	0.0102	
	Elephant shark	19.6	6	0.0032	0.0102	
	Lamprey	17.6	6	0.0072	0.0102	
	Vase tunicate	14.5	6	0.0244	0.0261	
	Amphioxus	19.6	6	0.0032	0.0102	
	Roundworm	17.7	6	0.0069	0.0102	
	Starlet sea anemone	19.2	6	0.0039	0.0102	
	Choanoflagellates	19.4	6	0.0036	0.0102	

Table S15. Statistical information in Figure S10a.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	21.0	7	0.0038	0.0062	
	Human	15.9	7	0.0262	0.0314	
	Cow	16.3	7	0.0227	0.0303	
	Opossum	20.8	7	0.0041	0.0062	
	Chicken	22.2	7	0.0024	0.0062	
	Western clawed frog	21.6	7	0.0030	0.0062	
	Coelacanth	22.0	7	0.0026	0.0062	
	Spotted gar	21.2	7	0.0035	0.0062	
	Elephant shark	22.3	7	0.0022	0.0062	
	Lamprey	15.2	7	0.0335	0.0335	
	Vase tunicate	15.4	7	0.0314	0.0335	
	Amphioxus	21.9	7	0.0026	0.0062	
	Chicken	Chicken	16.5	7	0.0213	0.0231
		Turkey	13.7	7	0.0561	0.0561
American alligator		21.7	7	0.0029	0.0054	
Softshell turtle		20.8	7	0.0041	0.0067	
Anole lizard		21.7	7	0.0028	0.0054	
Mouse		22.2	7	0.0024	0.0054	
Western clawed frog		22.1	7	0.0025	0.0054	
Coelacanth		21.7	7	0.0029	0.0054	
Spotted gar		22.0	7	0.0026	0.0054	
Elephant shark		21.8	7	0.0028	0.0054	
Lamprey		18.2	7	0.0112	0.0146	
Vase tunicate		19.1	7	0.0079	0.0114	
Amphioxus		16.6	7	0.0200	0.0231	
Medaka		Medaka	18.4	6	0.0054	0.0074
	Amazon molly	19.3	6	0.0037	0.0074	
	Tilapia	19.1	6	0.0040	0.0074	
	Fugu	18.6	6	0.0049	0.0074	
	Zebrafish	17.7	6	0.0069	0.0084	
	Spotted gar	17.0	6	0.0095	0.0105	
	Coelacanth	19.3	6	0.0037	0.0074	
	Elephant shark	19.4	6	0.0036	0.0074	
	Lamprey	18.7	6	0.0048	0.0074	
	Vase tunicate	10.2	6	0.1170	0.1170	
	Amphioxus	19.1	6	0.0039	0.0074	

Table S16. Statistical information in Figure S10b.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	22.0	7	0.0026	0.0048	
	Human	18.1	7	0.0114	0.0152	
	Cow	17.5	7	0.0145	0.0174	
	Opossum	21.3	7	0.0033	0.0050	
	Chicken	22.4	7	0.0021	0.0048	
	Western clawed frog	21.9	7	0.0027	0.0048	
	Coelacanth	21.9	7	0.0026	0.0048	
	Spotted gar	21.8	7	0.0028	0.0048	
	Elephant shark	22.1	7	0.0024	0.0048	
	Lamprey	15.5	7	0.0305	0.0305	
	Vase tunicate	15.8	7	0.0270	0.0295	
	Amphioxus	22.4	7	0.0022	0.0048	
	Chicken	Chicken	20.1	7	0.0055	0.0065
		Turkey	21.7	7	0.0028	0.0046
American alligator		22.5	7	0.0021	0.0046	
Softshell turtle		22.0	7	0.0025	0.0046	
Anole lizard		22.4	7	0.0021	0.0046	
Mouse		22.6	7	0.0020	0.0046	
Western clawed frog		22.7	7	0.0019	0.0046	
Coelacanth		22.0	7	0.0025	0.0046	
Spotted gar		21.5	7	0.0032	0.0046	
Elephant shark		21.9	7	0.0027	0.0046	
Lamprey		19.6	7	0.0065	0.0070	
Vase tunicate		13.6	7	0.0585	0.0585	
Amphioxus		20.7	7	0.0042	0.0055	
Medaka		Medaka	16.4	6	0.0118	0.0130
	Amazon molly	17.7	6	0.0071	0.0100	
	Tilapia	18.2	6	0.0058	0.0100	
	Fugu	17.6	6	0.0073	0.0100	
	Zebrafish	16.5	6	0.0113	0.0130	
	Spotted gar	14.0	6	0.0297	0.0297	
	Coelacanth	18.1	6	0.0060	0.0100	
	Elephant shark	19.6	6	0.0032	0.0094	
	Lamprey	19.5	6	0.0034	0.0094	
	Vase tunicate	19.5	6	0.0034	0.0094	
Amphioxus	19.6	6	0.0032	0.0094		

Table S17. Statistical information in Figure S10c.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	17.1	7	0.0170	0.0227	
	Human	16.4	7	0.0216	0.0236	
	Cow	17.8	7	0.0130	0.0195	
	Opossum	19.9	7	0.0058	0.0116	
	Chicken	21.3	7	0.0033	0.0116	
	Western clawed frog	20.4	7	0.0048	0.0116	
	Coelacanth	19.9	7	0.0058	0.0116	
	Spotted gar	18.8	7	0.0088	0.0151	
	Elephant shark	20.2	7	0.0051	0.0116	
	Lamprey	16.6	7	0.0202	0.0236	
	Vase tunicate	15.8	7	0.0267	0.0267	
	Amphioxus	21.3	7	0.0034	0.0116	
	Chicken	Chicken	18.9	7	0.0084	0.0102
		Turkey	16.7	7	0.0194	0.0194
American alligator		21.7	7	0.0029	0.0058	
Softshell turtle		21.1	7	0.0037	0.0060	
Anole lizard		21.6	7	0.0030	0.0058	
Mouse		22.1	7	0.0025	0.0058	
Western clawed frog		22.0	7	0.0026	0.0058	
Coelacanth		21.7	7	0.0029	0.0058	
Spotted gar		21.5	7	0.0031	0.0058	
Elephant shark		21.9	7	0.0026	0.0058	
Lamprey		17.7	7	0.0132	0.0143	
Vase tunicate		19.3	7	0.0072	0.0102	
Amphioxus		18.9	7	0.0086	0.0102	
Medaka		Medaka	17.0	6	0.0093	0.0128
	Amazon molly	18.4	6	0.0053	0.0121	
	Tilapia	17.9	6	0.0066	0.0121	
	Fugu	17.0	6	0.0092	0.0128	
	Zebrafish	16.0	6	0.0138	0.0169	
	Spotted gar	12.4	6	0.0533	0.0586	
	Coelacanth	18.1	6	0.0060	0.0121	
	Elephant shark	19.6	6	0.0032	0.0121	
	Lamprey	18.5	6	0.0052	0.0121	
	Vase tunicate	11.2	6	0.0838	0.0838	
	Amphioxus	19.6	6	0.0032	0.0121	

Table S18. Statistical information in Figure S11.

Species	Category	Kruskal–Wallis rank sum test			
		Test statistic (H)	Degrees of freedom	P value	FDR
Mouse	Mouse	28.1	11	0.0031	0.0036
	Human	28.0	11	0.0032	0.0036
	Cow	29.0	11	0.0023	0.0035
	Opossum	29.7	11	0.0018	0.0034
	Chicken	30.4	11	0.0014	0.0034
	Western clawed frog	30.2	11	0.0015	0.0034
	Coelacanth	30.1	11	0.0015	0.0034
	Spotted gar	30.2	11	0.0015	0.0034
	Elephant shark	29.4	11	0.0020	0.0034
	Lamprey	27.9	11	0.0033	0.0036
	Vase tunicate	27.7	11	0.0036	0.0036
	Amphioxus	30.3	11	0.0014	0.0034

Table S19. Statistical information in Figure S12a.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	19.8	7	0.0061	0.0145	
	Human	18.8	7	0.0088	0.0149	
	Cow	16.1	7	0.0243	0.0292	
	Opossum	16.3	7	0.0225	0.0292	
	Chicken	15.6	7	0.0290	0.0316	
	Western clawed frog	19.3	7	0.0072	0.0145	
	Coelacanth	15.0	7	0.0357	0.0357	
	Spotted gar	18.5	7	0.0099	0.0149	
	Elephant shark	20.0	7	0.0055	0.0145	
	Lamprey	19.5	7	0.0068	0.0145	
	Vase tunicate	20.3	7	0.0051	0.0145	
	Amphioxus	19.4	7	0.0071	0.0145	
	Chicken	Chicken	20.1	7	0.0053	0.0106
		Turkey	19.9	7	0.0059	0.0106
American alligator		20.2	7	0.0052	0.0106	
Softshell turtle		21.7	7	0.0028	0.0106	
Anole lizard		19.0	7	0.0081	0.0106	
Mouse		19.5	7	0.0068	0.0106	
Western clawed frog		17.4	7	0.0150	0.0163	
Coelacanth		21.5	7	0.0031	0.0106	
Spotted gar		19.0	7	0.0081	0.0106	
Elephant shark		20.9	7	0.0039	0.0106	
Lamprey		21.3	7	0.0034	0.0106	
Vase tunicate		17.4	7	0.0150	0.0163	
Amphioxus		15.4	7	0.0317	0.0317	
Medaka		Medaka	17.8	6	0.0067	0.0067
	Amazon molly	18.7	6	0.0047	0.0052	
	Tilapia	19.2	6	0.0039	0.0051	
	Fugu	19.3	6	0.0036	0.0051	
	Zebrafish	19.6	6	0.0032	0.0051	
	Spotted gar	19.4	6	0.0036	0.0051	
	Coelacanth	19.5	6	0.0034	0.0051	
	Elephant shark	19.4	6	0.0036	0.0051	
	Lamprey	19.4	6	0.0036	0.0051	
	Vase tunicate	19.0	6	0.0042	0.0051	
	Amphioxus	19.5	6	0.0034	0.0051	

Table S20. Statistical information in Figure S12b.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	18.7	7	0.0091	0.0144	
	Human	19.4	7	0.0071	0.0144	
	Cow	19.1	7	0.0078	0.0144	
	Opossum	19.7	7	0.0064	0.0144	
	Chicken	19.5	7	0.0066	0.0144	
	Western clawed frog	20.2	7	0.0052	0.0144	
	Coelacanth	13.5	7	0.0612	0.0612	
	Spotted gar	16.6	7	0.0204	0.0223	
	Elephant shark	18.6	7	0.0096	0.0144	
	Lamprey	16.7	7	0.0194	0.0223	
	Vase tunicate	17.1	7	0.0170	0.0223	
	Amphioxus	21.0	7	0.0037	0.0144	
	Chicken	Chicken	16.0	7	0.0252	0.0252
		Turkey	18.4	7	0.0101	0.0146
American alligator		21.6	7	0.0030	0.0108	
Softshell turtle		21.7	7	0.0029	0.0108	
Anole lizard		22.0	7	0.0025	0.0108	
Mouse		21.3	7	0.0033	0.0108	
Western clawed frog		17.9	7	0.0125	0.0163	
Coelacanth		18.5	7	0.0097	0.0146	
Spotted gar		20.3	7	0.0050	0.0108	
Elephant shark		16.5	7	0.0212	0.0230	
Lamprey		17.4	7	0.0150	0.0177	
Vase tunicate		19.1	7	0.0079	0.0146	
Amphioxus		20.3	7	0.0050	0.0108	
Medaka		Medaka	17	6	0.0094	0.0207
	Amazon molly	18	6	0.0062	0.0207	
	Tilapia	17.1	6	0.0088	0.0207	
	Fugu	16.4	6	0.0116	0.0213	
	Zebrafish	11.3	6	0.0798	0.0975	
	Spotted gar	9.16	6	0.1650	0.1815	
	Coelacanth	14.4	6	0.0252	0.0347	
	Elephant shark	19.6	6	0.0032	0.0177	
	Lamprey	14.8	6	0.0220	0.0346	
	Vase tunicate	8.76	6	0.1870	0.1870	
Amphioxus	19.6	6	0.0032	0.0177		

Table S21. Statistical information in Figure S12c.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Mouse	19.9	7	0.0059	0.0088	
	Human	16.1	7	0.0245	0.0267	
	Cow	15.0	7	0.0357	0.0357	
	Opossum	21.2	7	0.0034	0.0059	
	Chicken	22.2	7	0.0024	0.0052	
	Western clawed frog	22.4	7	0.0022	0.0052	
	Coelacanth	21.9	7	0.0026	0.0052	
	Spotted gar	21.9	7	0.0026	0.0052	
	Elephant shark	22.2	7	0.0023	0.0052	
	Lamprey	18.3	7	0.0109	0.0145	
	Vase tunicate	17.5	7	0.0147	0.0176	
	Amphioxus	22.3	7	0.0023	0.0052	
	Chicken	Chicken	20.5	7	0.0046	0.0075
		Turkey	18.0	7	0.0121	0.0143
American alligator		20.7	7	0.0046	0.0075	
Softshell turtle		21.2	7	0.0035	0.0075	
Anole lizard		21.5	7	0.0081	0.0117	
Mouse		22.0	7	0.0025	0.0075	
Western clawed frog		22.1	7	0.0024	0.0075	
Coelacanth		21.8	7	0.0027	0.0075	
Spotted gar		21.6	7	0.0030	0.0075	
Elephant shark		21.6	7	0.0030	0.0075	
Lamprey		18.6	7	0.0096	0.0125	
Vase tunicate		13.6	7	0.0588	0.0588	
Amphioxus		17.6	7	0.0137	0.0148	
Medaka		Medaka	16.6	6	0.0111	0.0111
	Amazon molly	17.8	6	0.0067	0.0104	
	Tilapia	18.4	6	0.0053	0.0104	
	Fugu	16.7	6	0.0085	0.0104	
	Zebrafish	17.5	6	0.0063	0.0104	
	Spotted gar	17.8	6	0.0079	0.0104	
	Coelacanth	17.5	6	0.0057	0.0104	
	Elephant shark	19.1	6	0.0042	0.0104	
	Lamprey	19.3	6	0.0097	0.0106	
	Vase tunicate	19	6	0.0044	0.0104	
	Amphioxus	19.5	6	0.0049	0.0104	

Table S22. Statistical information in Figure S13.

Species	Category	Kruskal–Wallis rank sum test				
		Test statistic (H)	Degrees of freedom	P value	FDR	
Mouse	Human	17.4	7	0.0149	0.0170	
	Cow	17.6	7	0.0141	0.0170	
	Opossum	21.5	7	0.0031	0.0073	
	Chicken	21.7	7	0.0028	0.0073	
	Western clawed frog	21.2	7	0.0035	0.0073	
	Coelacanth	21.2	7	0.0034	0.0073	
	Spotted gar	17.6	7	0.0141	0.0170	
	Elephant shark	22.1	7	0.0025	0.0073	
	Lamprey	17.1	7	0.0170	0.0170	
	Vase tunicate	17.1	7	0.0168	0.0170	
	Amphioxus	20.9	7	0.0040	0.0073	
	Chicken	Turkey	22.2	7	0.0024	0.0048
		American alligator	22.0	7	0.0025	0.0048
		Softshell turtle	21.0	7	0.0038	0.0051
Anole lizard		21.5	7	0.0032	0.0048	
Mouse		21.9	7	0.0026	0.0048	
Western clawed frog		21.9	7	0.0026	0.0048	
Coelacanth		21.8	7	0.0027	0.0048	
Spotted gar		21.5	7	0.0031	0.0048	
Elephant shark		21.9	7	0.0027	0.0048	
Lamprey		17.4	7	0.0148	0.0148	
Vase tunicate		19.3	7	0.0074	0.0089	
Amphioxus		18.8	7	0.0087	0.0095	
Medaka		Amazon molly	18.0	6	0.0062	0.0115
		Tilapia	18.5	6	0.0051	0.0115
	Fugu	17.7	6	0.0069	0.0115	
	Zebrafish	16.5	6	0.0113	0.0141	
	Spotted gar	14.9	6	0.0211	0.0234	
	Coelacanth	18.3	6	0.0056	0.0115	
	Elephant shark	19.6	6	0.0032	0.0115	
	Lamprey	16.6	6	0.0110	0.0141	
	Vase tunicate	9.1	6	0.1680	0.1680	
	Amphioxus	19.6	6	0.0032	0.0115	