表 2. 蛋白相对进化速率和长寿值显著负相关的基因.

Ensembl ID	Symbol	Rho[1]	P value
ENSG00000170927	PKHD1	-0.3218	0.00020
ENSG00000182362	YBEY	-0.3608	0.00033
ENSG00000018280	SLC11A1	-0.3008	0.00062
ENSG00000005436	GCFC2	-0.3000	0.00071
ENSG00000261236	BOP1	-0.3112	0.00079
ENSG00000163755	HPS3	-0.2895	0.00080
ENSG00000236320	SLFN14	-0.3191	0.00081
ENSG00000167880	EVPL	-0.2861	0.00084
ENSG00000164066	INTU	-0.2920	0.00100
ENSG00000161940	BCL6B	-0.3165	0.00113
ENSG00000148187	MRRF	-0.2964	0.00175
ENSG00000119684	MLH3	-0.2826	0.00176
ENSG00000131386	GALNT15	-0.2815	0.00184
ENSG00000165966	PDZRN4	-0.2901	0.00192
ENSG00000125247	TMTC4	-0.2720	0.00198
ENSG00000130305	NSUN5	-0.2843	0.00228
ENSG00000214290	COLCA2	-0.2872	0.00235
ENSG00000129003	VPS13C	-0.2588	0.00253
ENSG00000184434	LRRC19	-0.2612	0.00290
ENSG00000163689	C3orf67	-0.2572	0.00290
ENSG00000064692	SNCAIP	-0.2525	0.00325
ENSG00000090989	EXOC1	-0.3145	0.00337
ENSG00000140025	EFCAB11	-0.2867	0.00348
ENSG00000171219	CDC42BPG	-0.2597	0.00402
ENSG00000113971	NPHP3	-0.2654	0.00415
ENSG00000100813	ACIN1	-0.2755	0.00426
ENSG00000173705	SUSD5	-0.2570	0.00426
ENSG00000126001	CEP250	-0.2477	0.00466
ENSG00000007171	NOS2	-0.2406	0.00479
ENSG00000166143	PPP1R14D	-0.2850	0.00488
ENSG00000221941	ZBED8	-0.3098	0.00488
ENSG00000066279	ASPM	-0.2561	0.00494
ENSG00000133612	AGAP3	-0.3126	0.00503
ENSG00000139626	ITGB7	-0.2504	0.00504
ENSG00000090061	CCNK	-0.2597	0.00527
ENSG00000157426	AASDH	-0.2418	0.00558
ENSG00000163608	NEPRO	-0.2573	0.00572
ENSG00000114698	PLSCR4	-0.2924	0.00599
ENSG00000107554	DNMBP	-0.2368	0.00606
ENSG00000080839	RBMS2	-0.2604	0.00618
ENSG00000144369	FAM171B	-0.2596	0.00642
ENSG00000103047	TANGO6	-0.2492	0.00651
ENSG00000153157	SYCP2L	-0.2489	0.00682
ENSG00000169704	BTD	-0.2436	0.00710
ENSG00000008382	MPND	-0.2653	0.00734
ENSG00000151702	FLI1	-0.2975	0.00736
ENSG00000124570	AP5B1	-0.2584	0.00747
ENSG00000066933	MYO9A	-0.2296	0.00761
ENSG00000135093	USP30	-0.2576	0.00768
ENSG00000169679	BUB1	-0.2244	0.00769
ENSG00000178149	DALRD3	-0.2380	0.00776
ENSG00000259431	THTPA	-0.2457	0.00812
ENSG00000230873	STMND1	-0.2523	0.00842
ENSG00000141298	SSH2	-0.2275	0.00844
ENSG00000101407	TTI1	-0.2301	0.00844
ENSG00000135900	TAOK3	-0.2393	0.00848
ENSG00000198018	ENTPD7	-0.2556	0.00851
ENSG00000100100	BDKRB1	-0.2742	0.00855
ENSG00000163092	XIRP2	-0.2356	0.00871
ENSG00000119509	INVS	-0.2279	0.00884
ENSG00000159082	SYNJ1	-0.2348	0.00893
ENSG00000162618	ADGRL4	-0.2257	0.00899
ENSG00000158169	FANCC	-0.2306	0.00909
ENSG00000108592	FTSJ3	-0.2321	0.00921
ENSG00000124151	NCOA3	-0.2189	0.00961
ENSG00000126653	NSRP1	-0.2384	0.00964
ENSG00000135068	CYBB	-0.2575	0.00970
ENSG00000135253	KCP	-0.2426	0.01031
ENSG00000169762	TAPT1	-0.2619	0.01036
ENSG00000139218	SCAF11	-0.2191	0.01040
ENSG00000149292	TTC12	-0.2206	0.01042
ENSG00000157353	FUK	-0.2236	0.01055
ENSG00000166004	CEP295	-0.2376	0.01058
ENSG00000186096	KIF24	-0.2260	0.01063
ENSG00000164615	CAMLG	-0.2609	0.01065
ENSG00000172725	CORO1B	-0.2541	0.01074
ENSG00000138780	GSTCD	-0.2344	0.01095
ENSG00000165271	NOL6	-0.2238	0.01110
ENSG00000111641	NOP2	-0.2322	0.01139
ENSG00000103091	WDR59	-0.2404	0.01143
ENSG00000138376	BARD1	-0.2229	0.01144
ENSG00000104936	DMPK	-0.2543	0.01150
ENSG00000173230	GOLGB1	-0.2138	0.01152
ENSG00000141506	PIK3R5	-0.2261	0.01157
ENSG00000165168	HGSNAT	-0.2387	0.01202
ENSG00000149308	NPAT	-0.2187	0.01208
ENSG00000139044	B4GALNT3	-0.2187	0.01210
ENSG00000176209	SMIM19	-0.3063	0.01237
ENSG00000170619	COMMD5	-0.2752	0.01290
ENSG00000138684	IL21	-0.2582	0.01294
ENSG00000186871	ERCC6L	-0.2200	0.01329
ENSG00000124091	GCNT7	-0.2290	0.01340
ENSG00000184445	KNTC1	-0.2063	0.01344
ENSG00000119723	COQ6	-0.2255	0.01369
ENSG00000110786	PTPN5	-0.2334	0.01370
ENSG00000175591	P2RY2	-0.2443	0.01382
ENSG00000168779	SHOX2	-0.2949	0.01390
ENSG00000150403	TMCO3	-0.2358	0.01402
ENSG00000138346	DNA2	-0.2144	0.01429
ENSG00000158163	DZIP1L	-0.2359	0.01444
ENSG00000177125	ZBTB34	-0.2872	0.01445
ENSG00000168297	PXK	-0.2347	0.01447
ENSG00000169641	LUZP1	-0.2157	0.01448
ENSG00000166349	RAG1	-0.2294	0.01450
ENSG00000163156	SCNM1	-0.2429	0.01489
ENSG00000150347	ARID5B	-0.2156	0.01491
ENSG00000108469	RECQL5	-0.2147	0.01497
ENSG00000198270	TMEM116	-0.2357	0.01500
ENSG00000136861	CDK5RAP2	-0.2146	0.01541
ENSG00000047457	CP	-0.2163	0.01543
ENSG00000132781	MUTYH	-0.2197	0.01545
ENSG00000115956	PLEK	-0.2389	0.01560
ENSG00000024526	DEPDC1	-0.2191	0.01576
ENSG00000100692	FKTN	-0.2269	0.01565
ENSG00000038811	SCL38A11	-0.2247	0.01577
ENSG00000172939	OXSR1	-0.2641	0.01583
ENSG00000158445	KCNB1	-0.2094	0.01595
ENSG00000169507	ABCA4	-0.2067	0.01618
ENSG00000172320	OR5A1	-0.2464	0.01668
ENSG00000078589	P2RY10	-0.2425	0.01672
ENSG00000108559	NUP88	-0.2217	0.01679
ENSG00000006555	TTC22	-0.2253	0.01690
ENSG00000250067	YJEFN3	-0.2887	0.01697
ENSG00000126216	TUBGCP3	-0.2262	0.01699
ENSG00000166979	EVA1C	-0.2344	0.01716
ENSG00000105518	TMEM205	-0.2636	0.01740
ENSG00000172497	ACOT12	-0.2123	0.01744
ENSG00000168843	FSTL5	-0.2250	0.01760
ENSG00000166348	USP54	-0.2136	0.01767
ENSG00000111602	TIMELESS	-0.2076	0.01780
ENSG00000182918	OTOL1	-0.2158	0.01793
ENSG00000197299	BLM	-0.2057	0.01796
ENSG00000177017	NUMA1	-0.2049	0.01799
ENSG00000136141	LRCH1	-0.2086	0.01811
ENSG00000138182	KIF20B	-0.2031	0.01816
ENSG00000133863	TEX15	-0.2153	0.01823
ENSG00000162437	RAVER2	-0.2233	0.01850
ENSG00000215193	PEX26	-0.2519	0.01860
ENSG00000140022	STON2	-0.2312	0.01880
ENSG00000137177	KIF13A	-0.2124	0.01881
ENSG00000163751	CPA3	-0.2173	0.01914
ENSG00000124201	MACC1	-0.2003	0.01940
ENSG00000172819	RARG	-0.2828	0.01947
ENSG00000137574	TGS1	-0.1971	0.02001
ENSG00000159625	M1AP	-0.2060	0.02013
ENSG00000141337	ARSG	-0.2058	0.02026
ENSG00000141179	PCTP	-0.2317	0.02038
ENSG00000135476	ESPL1	-0.1972	0.02040
ENSG00000182173	TSEN54	-0.2193	0.02072
ENSG00000185313	RAD51D	-0.2163	0.02079
ENSG00000142233	NTN5	-0.2207	0.02110
ENSG00000164114	MAP9	-0.2018	0.02132
ENSG00000115850	LCT	-0.2299	0.02138
ENSG00000136932	TRMO	-0.2053	0.02163
ENSG00000120647	CCDC77	-0.2128	0.02184
ENSG00000107949	BCCIP	-0.2266	0.02200
ENSG00000109805	NCAPG	-0.2013	0.02216
ENSG00000100625	SIX4	-0.2205	0.02245
ENSG00000174405	LIG4	-0.2044	0.02278
ENSG00000165621	OXGR1	-0.2275	0.02285
ENSG00000164291	ARSK	-0.2031	0.02313
ENSG00000119681	LTBP2	-0.2004	0.02331
ENSG00000169508	GPR183	-0.2222	0.02337
ENSG00000107290	TTF2	-0.1927	0.02356
ENSG00000092067	CEBPE	-0.2528	0.02368
ENSG00000126602	TRAP1	-0.2080	0.02382
ENSG00000004700	RECQL	-0.2051	0.02400
ENSG00000198924	DCLRE1A	-0.1907	0.02450
ENSG00000132600	PRMT7	-0.1928	0.02451
ENSG00000156603	PRMT9	-0.1986	0.02463
ENSG00000136643	RPS6KC1	-0.2093	0.02475
ENSG00000104643	MTMR9	-0.2524	0.02482
ENSG00000188404	SELL	-0.2055	0.02495
ENSG00000110756	HPS5	-0.2038	0.02496
ENSG00000152527	PLEKHH2	-0.1977	0.02533
ENSG00000198208	RPS6KL1	-0.1996	0.02560
ENSG00000120262	CCDC170	-0.1900	0.02561
ENSG00000186007	LEMD1	-0.2593	0.02567
ENSG00000176945	MUC20	-0.2242	0.02568
ENSG00000162366	PDZK1IP1	-0.2255	0.02582
ENSG00000059377	TBXAS1	-0.1968	0.02596
ENSG00000132855	ANGPTL3	-0.2041	0.02600
ENSG00000153002	CPB1	-0.1990	0.02612
ENSG00000232070	TMEM253	-0.2370	0.02620
ENSG00000100351	GRAP2	-0.2234	0.02621
ENSG00000222028	PSMB11	-0.2343	0.02627
ENSG00000011454	RABGAP1	-0.2328	0.02636
ENSG00000151322	NPAS3	-0.2614	0.02654
ENSG00000134597	RBMX2	-0.2333	0.02692
ENSG00000107719	PALD1	-0.1940	0.02702
ENSG00000183640	KRTAP8-1	-0.3115	0.02767
ENSG00000179119	SPTY2D1	-0.1993	0.02778
ENSG00000163918	RFC4	-0.2293	0.02788
ENSG00000110777	POU2AF1	-0.2413	0.02798
ENSG00000118898	PPL	-0.1884	0.02802
ENSG00000215187	FAM166B	-0.2176	0.02805
ENSG00000184277	TM2D3	-0.2550	0.02834
ENSG00000081307	UBA5	-0.2273	0.02841
ENSG00000174233	ADCY6	-0.2659	0.02843
ENSG00000113282	CLINT1	-0.2191	0.02848
ENSG00000147526	TACC1	-0.1994	0.02903
ENSG00000156787	TBC1D31	-0.1861	0.02943
ENSG00000006459	KDM7A	-0.2005	0.02946
ENSG00000074771	NOX3	-0.1909	0.02958
ENSG00000187164	SHTN1	-0.2025	0.03001
ENSG00000112242	COL24A1	-0.2006	0.03013
ENSG00000178295	GEN1	-0.1932	0.03016
ENSG00000132464	ENAM	-0.1882	0.03073
ENSG00000110077	ZZEF1	-0.1833	0.03075
ENSG00000178127	NDUFV2	-0.2703	0.03078
ENSG00000152404	CWF19L2	-0.1962	0.03104
ENSG00000007952	NOX1	-0.2106	0.03107
ENSG00000125863	MKKS	-0.1897	0.03129
ENSG00000121741	ZMYM2	-0.2026	0.03136
ENSG00000174201	ZMYM3	-0.2032	0.03168
ENSG00000164347	GFM2	-0.1863	0.03175
ENSG00000139971	C14orf37	-0.1945	0.03185
ENSG00000155229	MMS19	-0.1928	0.03190
ENSG00000149635	OCSTAMP	-0.2010	0.03196
ENSG00000158411	MITD1	-0.2203	0.03196
ENSG00000092978	GPATCH2	-0.2135	0.03208
ENSG00000145220	LYAR	-0.2042	0.03233
ENSG00000127951	FGL2	-0.1972	0.03235
ENSG00000162512	SDC3	-0.2068	0.03262
ENSG00000165678	GHITM	-0.2216	0.03275
ENSG00000174946	GPR171	-0.2192	0.03279
ENSG00000165821	SALL2	-0.2046	0.03287
ENSG00000136925	TSTD2	-0.1909	0.03294
ENSG00000175592	FOSL1	-0.2417	0.03303
ENSG00000139304	PTPRQ	-0.1962	0.03320
ENSG00000167483	FAM129C	-0.2119	0.03344
ENSG00000109944	JHY	-0.1803	0.03364
ENSG00000136824	SMC2	-0.1883	0.03404
ENSG00000075702	WDR62	-0.1822	0.03442
ENSG00000071889	FAM3A	-0.2398	0.03449
ENSG00000175854	SWI5	-0.2547	0.03467
ENSG00000172878	METAP1D	-0.2307	0.03478
ENSG00000011748	RPA2	-0.2265	0.03489
ENSG00000197702	PARVA	-0.1919	0.03498
ENSG00000169087	HSPBAP1	-0.1857	0.03509
ENSG00000166268	MYRFL	-0.1993	0.03515
ENSG00000183955	KMT5A	-0.2356	0.03539
ENSG00000162367	TAL1	-0.2401	0.03544
ENSG00000178921	PFAS	-0.1824	0.03561
ENSG00000110298	CCDC94	-0.2269	0.03565
ENSG00000164935	DCSTAMP	-0.1858	0.03577
ENSG00000203797	VEPH1	-0.1902	0.03589
ENSG00000203797	DDO	-0.1933	0.03599
ENSG00000168811	IL12A	-0.2020	0.03603
ENSG00000107175	CREB3	-0.1930	0.03623
ENSG00000184384	MAML2	-0.2040	0.03681
ENSG00000196943	NOP9	-0.1840	0.03689
ENSG00000179008	C14orf39	-0.1897	0.03719
ENSG00000063854	HAGH	-0.2139	0.03742
ENSG00000107614	TRDMT1	-0.1943	0.03746
ENSG00000125910	S1PR4	-0.2209	0.03748
ENSG00000113555	PCDH12	-0.1877	0.03767
ENSG00000275066	SYNRG	-0.1817	0.03779
ENSG00000174944	P2RY14	-0.2069	0.03787
ENSG00000214960	ISPD	-0.2143	0.03809
ENSG00000141127	PRPSAP2	-0.2777	0.03824
ENSG00000158352	SHROOM4	-0.1840	0.03834
ENSG00000227057	WDR46	-0.1839	0.03846
ENSG00000115368	WDR75	-0.1868	0.03853
ENSG00000161929	SCIMP	-0.1949	0.03859
ENSG00000248487	ABHD14A	-0.2245	0.03890
ENSG00000151715	TMEM45B	-0.1990	0.03895
ENSG00000133216	EPHB2	-0.2389	0.03898
ENSG00000204161	C10orf128	-0.2528	0.03900
ENSG00000073803	MAP3K13	-0.1832	0.03922
ENSG00000105701	FKBP8	-0.2419	0.03926
ENSG00000129197	RPAIN	-0.1960	0.03929
ENSG00000174306	ZHX3	-0.1854	0.03930
ENSG00000135837	CEP350	-0.1796	0.03934
ENSG00000132275	RRP8	-0.1853	0.03937
ENSG00000135968	GCC2	-0.1788	0.03953
ENSG00000151849	CENPJ	-0.1740	0.03975
ENSG00000198812	LRRC10	-0.2135	0.03988
ENSG00000157538	DSCR3	-0.2362	0.03993
ENSG00000175309	PHYKPL	-0.2026	0.04014
ENSG00000112149	CD83	-0.1968	0.04021
ENSG00000166090	IL25	-0.2154	0.04029
ENSG00000117877	CD3EAP	-0.1939	0.04051
ENSG00000206384	COL6A6	-0.1895	0.04071
ENSG00000157111	TMEM171	-0.1871	0.04078
ENSG00000050405	LIMA1	-0.1745	0.04144
ENSG00000149439	GCNT3	-0.1994	0.04144
ENSG00000162063	CCNF	-0.1847	0.04167
ENSG00000134030	CTIF	-0.1946	0.04167
ENSG00000136883	KIF12	-0.1802	0.04185
ENSG00000170734	POLH	-0.1760	0.04198
ENSG00000171791	BCL2	-0.2549	0.04211
ENSG00000213347	MXD3	-0.2100	0.04224
ENSG00000165732	SOGA1	-0.1769	0.04250
ENSG00000174231	DDX21	-0.1863	0.04253
ENSG00000152223	EPG5	-0.1793	0.04285
ENSG00000137812	KNL1	-0.1890	0.04310
ENSG00000025293	PHF20	-0.1913	0.04329
ENSG00000171723	GPHN	-0.2868	0.04343
ENSG00000120756	PLS1	-0.2088	0.04343
ENSG00000154222	CC2D1B	-0.1823	0.04353
ENSG00000180902	D2HGDH	-0.1928	0.04362
ENSG00000173634	NXPE4	-0.2011	0.04380
ENSG00000119321	FKBP15	-0.1712	0.04392
ENSG00000040297	TADA2B	-0.2830	0.04420
ENSG00000083097	DOPEY1	-0.1734	0.04424
ENSG00000111247	RAD51AP1	-0.1855	0.04433
ENSG00000184661	CDCA2	-0.1809	0.04433
ENSG00000188641	DPYD	-0.1930	0.04433
ENSG00000119943	PYROXD2	-0.1794	0.04444
ENSG00000135077	HAVCR2	-0.2035	0.04444
ENSG00000183864	TOB2	-0.2341	0.04471
ENSG00000185298	CCDC137	-0.1979	0.04509
ENSG00000115459	ELMOD3	-0.1915	0.04511
ENSG00000111837	MAK	-0.1781	0.04513
ENSG00000141569	TRIM65	-0.1905	0.04526
ENSG00000146067	FAM193B	-0.1855	0.04530
ENSG00000076382	SPAG5	-0.1725	0.04548
ENSG00000198542	ITGBL1	-0.1869	0.04551
ENSG00000180035	ZNF48	-0.1822	0.04553
ENSG00000112336	DPP7	-0.1890	0.04592
ENSG00000109736	MFSD10	-0.1898	0.04597
ENSG00000123178	MXD4	-0.2544	0.04600
ENSG00000172803	SNX32	-0.2084	0.04620
ENSG00000149359	CEP162	-0.1752	0.04622
ENSG00000221829	FANCG	-0.1800	0.04630
ENSG00000162777	DENND2D	-0.1912	0.04637
ENSG00000081059	TCF7	-0.2203	0.04673
ENSG00000060642	PIGV	-0.1782	0.04675
ENSG00000108784	NAGLU	-0.1800	0.04730
ENSG00000077044	DGKD	-0.1861	0.04742
ENSG00000023516	TM7SF3	-0.1805	0.04753
ENSG00000023516	AKAP11	-0.1690	0.04754
ENSG00000005700	IBTK	-0.1746	0.04778
ENSG00000057468	MSH4	-0.1735	0.04831
ENSG00000123179	EBPL	-0.2064	0.04836
ENSG00000198056	PRIM1	-0.2009	0.04853
ENSG00000089902	RCOR1	-0.2270	0.04862
ENSG00000113810	SMC4	-0.1810	0.04879
ENSG00000167964	RAB26	-0.2224	0.04880
ENSG00000146670	CDCA5	-0.1858	0.04884
ENSG00000144504	SLC41A3	-0.1883	0.04884
ENSG00000173236	CD101	-0.1704	0.04906
ENSG00000166450	PRTG	-0.1847	0.04915
ENSG00000005194	CIAPIN1	-0.1944	0.04915
ENSG00000183760	ACP7	-0.1855	0.04917
ENSG00000054796	SPO11	-0.1807	0.04922
ENSG00000010292	NCAPD2	-0.1701	0.04939
ENSG00000136770	DNAJC1	-0.1773	0.04981

Notes: Rho[1], the correlation between relative evolutionary rates of genes and the evolution of traits across a phylogeny.