Supplementary Figure 1. Comparative evidence for 3 new readthrough candidates: (A-C) Genomic alignments of the readthrough extensions of *ACP2*, *AQP4*, and *MAPK10* with other eutherian mammal genomes, colour coded using CodAlignView ("CodAlignView: a tool for visualizing protein-coding constraint", I Jungreis, M Lin, M Kellis, in preparation). The high concentrations of synonymous substitutions (light green) and conservative amino acid changes (dark green), and relatively low concentrations of radical amino acid changes (red) and frame shifted regions (orange) is characteristic of protein-coding regions. PhyloCSF scores for these extensions are higher than 99% of similar-sized non-coding regions, indicating that they have been functional at the amino acid level in much of the eutherian mammal tree. Horizontal lines in the *ACP2* alignment indicate paired bases in the predicted RNA stem loop. (D) Conserved RNA stem loop 3' of the UGA stop codon in *ACP2*, as predicted by RNAz.

Supplementary Figure 2. Per-codon PhyloCSF scores of the predicted readthrough extensions of the seven readthrough candidates (blue stars) relative to the distributions for coding and non-coding regions. Non-coding distribution was computed from "third ORFs", i.e., the region from the first in-frame stop codon after an annotated stop codon to the next in-frame stop codon, excluding regions that overlap the coding region of another annotated transcript. Coding distribution was computed from same-sized regions directly 5' of the annotated stop codon. Regions less than 10 codons or for which the aligned species encompass less than 10% of the branch length of the 29-mammals tree were excluded because PhyloCSF has insufficient power on such regions. All seven readthrough regions have scores near the middle of the coding distribution and higher than 99.96% of non-coding regions.

Supplementary Figure 3. Nucleotide and codon alignments of the regions corresponding to the end of the main ORF, the readthrough ORF and the flanking sequences of (A) *AQP4*, (B) *MAPK10*, (C) *OPRK1*, (D) *OPRL1* and (E) *SACM1L*. The alignments in A, B, C and D were generated by custom python scripts and clustalW2. First the given region in the main ORF was conceptually translated into a peptide sequence. The conceptual peptide sequences were aligned using ClustalW2. This amino acid alignment was back-translated to a corresponding nucleotide alignment based on codons corresponding to amino acids in the alignment using the initial nucleotide sequences. Finally, the common ancestral (root) sequence was inferred using PyCogenet python module v. 1.5.3 (1) using a ClustalW guide tree. The alignment shown in E used a variant of the procedure for A-D where an alignment was performed directly on the nucleotide sequence with ClustalX2. This nucleotide alignment was then manually adjusted and converted into a corresponding protein sequence alignment which was used to generate a guide tree and evaluate the root sequence as described earlier. Synonymous and non-synonymous substitutions were determined relative to the inferred root sequence shown on top of each alignment. In these alignments, consensus (root) codons (and gaps) are highlighted in white, synonymous codons are highlighted in green, non-synonymous codons are highlighted in brown and stop codons are highlighted in magenta. Abbreviated species identifiers of the sequences used are indicated on the left. Full names of the species whose sequences are used in A-E: *Ailuropoda melanoleuca, Alligator mississippiensis, Anolis carolinensis, Bos Taurus, Callithrix* *jacchus, Callorhinchus milii, Camelus ferus, Canis lupus familiaris, Ceratotherium simum, Chrysemys picta bellii, Condylura cristata, Cricetulus griseus, Danio rerio, Dasypus novemcinctus, Dicentrarchus labrax, Elephantulus edwardii, Equus caballus, Erinaceus europaeus, Felis catus, Ficedula albicollis, Gadus morhua, Gallus gallus, Gasterosteus aculeatus, Geospiza fortis, Haplochromis burtoni, Homo sapiens, Latimeria chalumnae, Lepisosteus oculatus, Leucoraja erinacea, Lipochromis sp., Loxodonta africana, Macaca mulatta, Macropus eugenii, Maylandia zebra, Mchenga conophoros, Meleagris gallopavo, Melopsittacus undulates, Monodelphis domestica, Mus musculus, Mustela putorius furo, Myotis davidii, Neolamprologus brichardi, Nomascus leucogenys, Ochotona princeps, Odobenus rosmarus, Oncorhynchus mykiss, Orcinus orca, Oreochromis niloticus, Ornithorhynchus anatinus, Orycteropus afer, Oryctolagus cuniculus, Oryzias latipes, Otolemur garnettii, Ovis aries, Pelodiscus sinensis, Perca flavescens, Pimephales promelas, Procavia capensis, Pteropus alecto, Pteropus vampyrus, Pundamilia nyererei, Python molurus, Rattus norvegicus, Saimiri boliviensis boliviensi, Salmo salar, Sarcophilus harrisii, Sus scrofa, Taeniopygia guttata, Takifugu rubripes, Tarsius syrichta, Tetraodon nigroviridis, Torpedo californica, Trichechus manatus, Tursiops truncates, Vicugna pacos, Xenopus laevis, Xenopus tropicalis, Xiphophorus maculates.* The sequences used in the alignments here were obtained from GenBank using the BLAST (tblastn) algorithm where the translated human sequence was used as bait. The target databases during this search were Expressed Sequence Tags (EST), the Whole-Genome Shotgun contigs, and Transcriptome Shotgun Assembly. All non-mammalian orthologous sequences that could be identified, as well as representative number of mammalian sequences were collected and used in the alignments.

Supplementary Figure 4. Amino acid conservation of OPRK1 and OPRL1 readthrough extensions. The conservation is shown as amino acid logogram (A) of the OPRK1, and (B) the ORPL1 readthrough extensions, respectively. The five highly conserved amino acids near their C-terminal ends, that also show sequence similarity between the two paralogs, are boxed in read. To build the conservation plots the nucleotide sequence alignment for the *OPRK1* and *OPRL1* readthrough extensions (Supplementary Figures 3C and D) were converted into amino acid sequence alignments and used to generate logogram utilizing WebLogo (2).

Supplementary Figure 5. (a) Dual luciferase assay indicating readthrough efficiencies of *OPRL1* constructs with only one 5' nt and with 3' nested deletions showing the importance of the nt immediately 3'. (B) The effect of nt identity immediately 5' of the *OPRL1* UGA on readthrough efficiency. (C) The effect of replacing the UGA stop codon with either UAA or UAG on the readthrough efficiencies of wild type *OPRL1* and *OPRL1*-CARYYA.

REFERENCES

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2. Crooks, G.E., Hon, G., Chandonia, J.M. and Brenner, S.E. (2004) WebLogo: a sequence logo generator. Genome Res., 14, 1188-1190.

Supplementary Figure 1A

Human_aa	D	H	A	*	Q	P	L	S	P	L	P	S	T	S	*	G	R	W	A	G	P	S
Paired RNA																						
ancestor	GAC	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTG
Human	GAC	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCC	ACC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TCG
Chimp	GAC	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCC	ACC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TCG
Rhesus	GAC	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCG	CTT	CCC	TCC	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TCG
Tarsier	GAC	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCT	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AAG	TGG	GCT	GG-	CCC	TTG
Mouse_lemur	GAC	-AT	GC-	TGA	CAG	C-A	CTC	AGC	CCG	CTT	CCC	TCT	GC-	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTG
Bushbaby	GAC	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCG	CTT	CCC	TCT	ACC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCT	TTG
TreeShrew	GAC	CAT	GCC	TGA	CAC	CCA	GCT	GGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	AGG	GCT	GGG	CCC	TTG
Mouse	GAC	CAT	GCT	TGA	CAA	CCA	CTC	AGT	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GAG	TCC	TCG
Rat	GAC	CAT	GCT	TGA	CAA	CCA	CTC	AGT	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	ATG	TGG	GCT	GAG	TCC	TTG
Kangaroo_rat	GAT	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTC
Guinea_Pig	GAC	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	GCT	GCC	TCC	TAG	GGA	A-G	TGG	GCT	GG-	-CC	CCG
Squirrel	GAC	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	-CC	CTG
Rabbit	GAC	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCC	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GG-	CCC	TTG
Pika	GAC	CGC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTC	CCC	TCT	GCC	TGC	TAG	GGG	AGG	TGG	GCT	GGA	CCT	TTG
Dolphin	GAC	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TCG	GGG	AGG	TGG	GCT	GGG	CC-	TTG
Cow	GAC	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTG
Horse	GAT	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTG
Cat	GAT	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTG
Dog	GAT	CAT	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTG
Microbat	GAT	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCT	TAG	GGG	AGG	TGG	GCT	TGG	CCC	TCA
Megabat	GAT	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	TGG	CCC	TTA
Hedgehog	GAC	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	CTG
Shrew	GAC	CAC	GCC	TGA	CAA	CCG	CTC	AGC	CCT	CTT	CCC	TCG	GCC	TCC	TAG	GGG	AGG	TGG	GCT	G--	---	---
Elephant	GAC	CAT	GCC	TGA	CAG	CTA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	TTG
Rock_hyrax	GAC	CAC	GCC	TGA	CAA	CCA	CTC	AGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	TGG	GCT	GGG	CCC	CTG
Tenrec	GAC	CAT	GCC	TGA	CAA	CCA	CT-	GGC	CCC	CTT	CCC	TCT	GCC	TCC	TAG	GGG	AGG	CGG	GCT	GGG	CCC	TTG
Armadillo	GAC	CAT	GCC	TGA	CAC	CTA	CTC	CGC	CCC	CTT	CCT	TCT	GTC	TCC	TAG	GGG	AG-	---	---	---	---	---

ACP2

No Change	GAC
Synonymous	GAT
Conservative	GAA
Radical	GGG
TAA Stop	TAA
TAG Stop	TAG
TGA Stop	TGA
Indel	GA-
Frameshifted	GAC

Supplementary Figure 1B

```
   Human_aa  S   S   V   *   L   E   D   R   T   E   S   R   Q   D   S   L   E   L   S   S   D   F   L   P   P   I   K   E   T   D   L   L   *   I   R   N   V   Q
   ancestor TCT TCA GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA CGA GAA CCC TTA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAT GTG CAG
      Human TCT TCA GTA TGA CTA GAA GAT CGC ACT GAA AGC AGA CAA GAC TCC TTA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA AAT GTG CAG
      Chimp TCT TCA GTA TGA CTA GAA GAT CGC ACT GAA AGC AGA CAA GAC TCC TTA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA AAT GTG CTG
     Rhesus TCT TCA GTA TGA CTA GAA GAT CGC ACT GAA AGC AGA CAA GAC TCC TTA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTA TTA TAA ATT AGA CAT GTG CAG
    Tarsier TCT TCA GTA TGA CTA GAA GAC AGC ACT GAA AAC AGA CGA GAC ACC TTA GAA TTG TCC TCA GAT TTT CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAT GTG CAG
Mouse_lemur TGT CTC GTA TGA CTA GGA GAC AGC ACT GA- AGC AGA --- --- --- --- --- --- ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ... ...
   Bushbaby TCT TCA GTA TGA CTA GAA GAC AGC GCT GAG AGC AGA CGA GAC TCC CTA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAC GAG CAG
  TreeShrew TCT TCA GTA TGA CTA GAA GAT AGC ACT GAG AGC AGA CGA GAC CCC TTA GAA CTG TCC TCA GAT TTC CTC CCA CCC ATT AAG GAA ACA GAT TTG TTA TGA ATT AGA CAC GTA CAG
      Mouse TCT TCC GTA TGA CTA GAG GAC AGC ACT GAA GGC AGA AGA GAC TCC CTA GAC CTG GCC TCA GAT TTC CTG CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAC TTG CGG
        Rat TCT TCT GTA TGA CTA GAG GAC AGC ACT GAA AAC AGA AGA GAC TCC CTA GAA CTG GCC TCA GAT TTC CTG CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAT ATG CGG
Kangaroo_rat TCT TCA GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA CGA GAC CCC TTA GAA CGG TCC TCA GAT TTC CTT CCC CCT ATC AAG GAG ACA GAT TTG TTG TAA ATT AGA CAC ATG CAG
 Guinea_Pig TCT TCG GTA TGA CTA GAA GAC GGC ACT GAA AGC AGA CGA GAC TCC TTA GAA CTG TCC TCA GAT TTC CTT CCG CCC ATT AAG GAA ACA GAT TTG TTG TAA GTT AGA CAC AAG CAG
   Squirrel TCT TCA GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA AGA GAA CCC TTA GAA CGG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAG ACA GAT TTG TTA TAA ATT AGA CAT GTG CAG
     Rabbit TCT TCC GTA TGA CTA GAA GAA AGC ACT GAA AGC AGA CAA GAC CCT GTG GAA GAG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT GGG CAT GTA CAG
       Pika TCC TCA GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA CAA CGT CC- --A GGA GAG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TGA ATT AGG CAT GTG CAG
     Alpaca TCT TCA GTA TGA CTA GAG GAC AGC ACT GAA AGC AGA CAA GAA CCC TTA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT CTG TTA TAA ACT AGA CAT GTA CAG
    Dolphin TCT TCA GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA CAA GAG CCC TTA GAA CTG TCC TCA GAT TTT CTT CCG CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAT GTG CAG
        Cow TCT TCA GTA TGA CTA GCA GGC AGC ACT GAA AGC AGA CAA GAG CCC TTA GAA CTG TCC TCA GAT CTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAT GTG CAG
      Horse TCT TCA GTA TGA CTA GAA GAC AGC ACT GAA AGC AGA CAA GAA CCC TTA GAA CTG TCC TCA GAT TTC CTC CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAC GTG CAG
        Dog TCA TCG GTA TGA CTA GAA GGT GGC ACT GAA AAC AGA CAG GAG CCC TCA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAC GCG CAG
   Microbat TCC TCC GTA TGA CTA GAA GAT GGC ACT GAA AGC AGA CGC GAG CCC TTA GAG CTG CCC GCA GAG GTC CTC CCG CCC ATT AAG GAA ACA GAC TTG TTA TAA GGT AGA CGT GT- ---
    Megabat TCT TCG GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA CAA GAA CCC TTA GAA CTA TCC TCA GAT TTC CTT CCA CAC ATT AAG GAA ACA GAT TTG TTA TAA ATT AGA CAT GTG CAG
      Shrew TCT TCA GTA TGA CTA GAA GAC AGC ACT GAA AAC AGA CAA GAG CCC TTC CAG CCA TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG CTA TAA ATG AGA CAT GTG CAG
   Elephant TCT TCA GTA TGA CTA GAA GGT AGC ACT GAA AGC AGA CGG GAA CCC TTA GAA CTA TCC TCA GAT TTC CTT CCA CCC ATT AAA GAA ACA GAT TTG TTA TAA -CT AGC CCT GT- -AA
 Rock_hyrax TCT TCG GTA TGA CTA GAG GAA AGC ACT GAA AGC AGA CGA GAA CCC TTA GAA CTA TCC TCA GAT TTC CTT CCA CCC ATT AAA GAA ACA GAT TTG TTG TAA -CT AGA TAT GTG CAG
     Tenrec TCT TCC GTA TGA CTA GAA GAC AGC GCT GAG AGC AGA CGG GAA CCC GTA GAC CTG GCC TCA GAT TTC CTT CCA CCC ATT AAA GAA ACA GAT TTG CTA TAA -TT AGA CAC GTG CAG
  Armadillo TCT TCA GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA CGA GGA CCC TTA GAA CTG TCC TCA GAT TTC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TAA GTT AGA CAT GAG CAG
      Sloth TCT TCA GTA TGA CTA GAA GAT AGC ACT GAA AGC AGA CGA GAA CCC TTA GAA CGA TCC ACA GAT TAC CTT CCA CCC ATT AAG GAA ACA GAT TTG TTA TGA ATT AGA CAT GAG CAG
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AQP4

No Change	GAC
Synonymous	GAT
Conservative	GAA
Radical	GGG
TAA Stop	TAA
TAG Stop	TAG
TGA Stop	TGA
Indel	GA-
Frameshifted	GAC

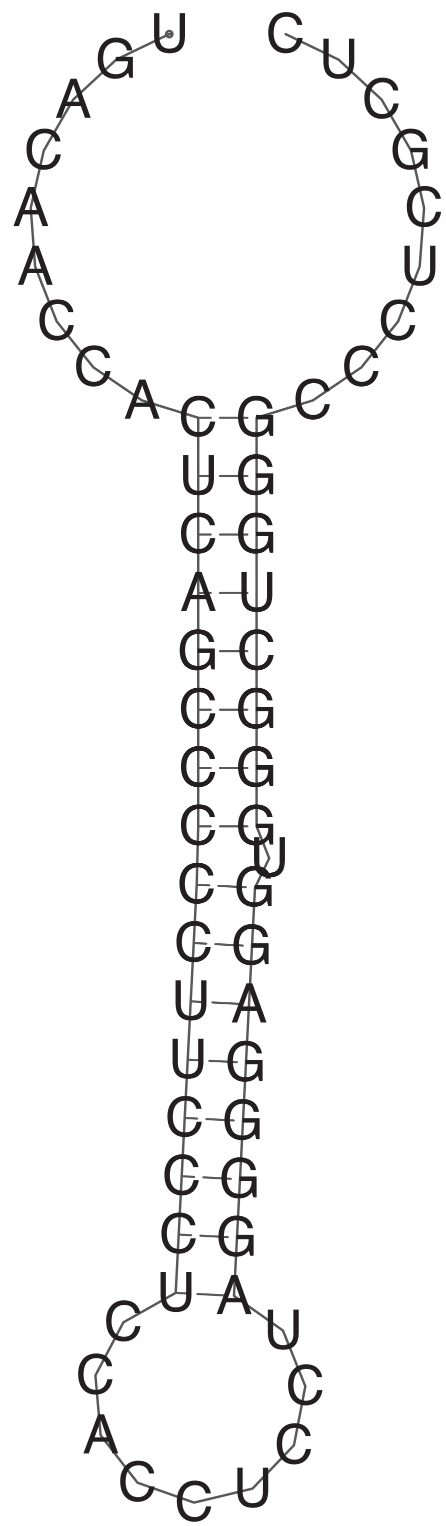
Supplementary Figure 1C

Human_aa	C	C	R	*	L	A	A	C	L	R	N	P	A	F	F	R	R	*	C	D	G	T
ancestor	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Human	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Chimp	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Rhesus	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Tarsier	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAT	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Mouse_lemur	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	CG---T---	GAT	GGA----	GCA
Bushbaby	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
TreeShrew	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---A---	GAT	GGA----	ACA
Mouse	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	CG---C---	GAT	AGA----	ACA
Rat	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	CG---CCAT	GAT	AGA----	ACA
Kangaroo_rat	TGC	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCA	TTC	TTC	AGG	AGA	TGA	TA---C---	GAT	AGA----	ACA
Guinea_Pig	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	TTG	CGG	AAC	CCA	GCG	TTC	TTC	AGG	AGC	TGA	GG---G---	GAT	GGA----	ACA
Squirrel	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Rabbit	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Pika	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TGATGT---	GAT	GGA----	ACA
Alpaca	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCG	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Dolphin	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	ACG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Cow	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Horse	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGAGCAC	ACA
Cat	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCA	TTC	TTC	AGG	AGA	TGA	TG---C---	GAT	GGA----	ACA
Dog	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA
Microbat	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGC	AGA	TGA	TG---G---	GAT	GGA----	ACA
Megabat	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---C---	GAT	GGG----	ACA
Hedgehog	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	AGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	CA---T---	GAC	GGA----	ACA
Shrew	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	CA---T---	GAT	GGA----	ACA
Elephant	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---C---	GAT	GGA----	ACA
Rock_hyrax	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---C---	GAT	GGA----	ACA
Tenrec	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---C---	GAT	GGG----	ATA
Armadillo	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---G---	GAT	GGA----	ACA
Sloth	TGT	TGC	AGG	TGA	CTA	GCC	GCC	TGC	CTG	CGA	AAC	CCA	GCG	TTC	TTC	AGG	AGA	TGA	TG---T---	GAT	GGA----	ACA

MAPK10

No Change	GAC
Synonymous	GAT
Conservative	GAA
Radical	GGG
TAA Stop	TAA
TAG Stop	TAG
TGA Stop	TGA
Indel	GA-
Frameshifted	GAC

Supplementary Figure 1D



Supplementary Figure 2