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Supporting Online Material for

## Virus Attenuation by Genome-Scale Changes in Codon Pair Bias

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**This PDF file includes:**

Materials and Methods Figs. S1 to S4

Tables S1 and S2 References

# Supplementary Materials

## Materials and Methods

**Definition and Calculation of codon pair bias.** We developed an algorithm to quantify codon pair bias. For each of the 3721 possible codon pairs (excluding Stop codon pairs) we calculated a “*C*odon *P*air *S*core”, or “CPS”. We define the CPS as the natural log of the ratio of the observed over the expected number of occurrences of each codon pair over all human coding regions (Fig. S1, Table S1). Although the calculation of the observed occurrences of a particular codon pair is straightforward (the actual count within the gene set), the expected number of occurrences of a codon pair requires additional calculation. We calculate this expected number so as to be independent both of amino acid frequency and of codon bias similarly to Gutman and Hatfield (S*1*). That is, the expected frequency is calculated based on the relative proportion of the number of times an amino acid is encoded by a specific codon (Fig. S1). A positive CPS value signifies that the given codon pair is statistically over-represented, and a negative CPS indicates the pair is statistically under-represented in the human genome. The calculated CPS scores for all 3721 possible codon pairs can be found in Table S1.

Using these calculated CPSs, the *C*odon *P*air *B*ias (CPB) for an entire open reading frame can then be calculated as the arithmetic mean of the individual codon pair scores. The CPB has been calculated for a core set of 14795 consistently annotated human genes (CCDS data set issued by NBCI, release date March 2nd 2005) using the equations shown in Fig. S1 and plotted (Fig. 1B, main text). Each point in the graph

corresponds to the CPB of a single human gene. A negative CPB signifies a prevalent use of underrepresented codon pairs, while a positive CPB indicates predominant use of overrepresented codon pairs. The peak of the distribution has a positive codon pair bias of 0.07, which is the mean score for all annotated human genes.

**Development and Implementation of computer-based algorithm to produce codon pair deoptimized sequences.** Using these formulas we next developed a computer based algorithm to manipulate the CPB of any coding region while maintaining the original amino acid sequence. The algorithm has the critical ability to maintain the codon usage of a gene (i.e. preserve the frequency of use of each existing codon) but “shuffle” the existing codons so that the CPB can be increased or decreased. The algorithm uses simulated annealing, a mathematical process suitable for full-length optimization (S*2*).

Other parameters are also under the control of this algorithm; for instance, the free energy of the folding of the RNA. This free energy is maintained within a narrow range, to prevent large changes in secondary structure as a consequence of codon re-arrangement. The optimization process specifically excludes the creation of any regions with large secondary structures, such as hairpins or stem loops, which could otherwise arise in the customized RNA. Using this computer software the user simply needs to input the cDNA sequence of a given gene and the CPB of the gene can be customized as the experimenter sees fit. In the experiments here, the starting CPB of wild-type poliovirus (i.e., PV(M)-wt) is -0.02, while PV-Min has a CPB of -0.48, and PV-Max has a CPB of 0.25.

Additional customization included inclusion of restriction sites that were designed into both synthetic sequences at given intervals, to allow for sub-cloning of the P1 region.

**DNA Synthesis, Plasmids, Sub cloning of Synthetic Capsids and Bacteria.** Poliovirus cDNA fragments with altered codon pair bias, corresponding to nucleotides 495 to 3636 of the viral genome, were synthesized *de novo* (Blue Heron Corp, Bothell, WA). All subsequent poliovirus cDNA clones/sub clones were constructed based on plasmid pT7PVM, which contains a full length infectious cDNA clone of poliovirus type 1 Mahoney [PV(M)] downstream of a T7 RNA polymerase promoter (S*3*). Specifically, the synthetic PV-Min, PV-Max cassettes were released from Blue Heron’s carrier vector via *PflM* I digestion and used to replace the respective *PflM* I fragment in the pT7PVM vector. The PV-MinXY and PV-MinZ constructs were obtained by digestion with *Nhe* I and *Bgl* II simultaneously, then swapping this fragment with a pT7PVM vector digested similarly. PV-MinX and PV-MinYZ were constructed via *Bsm* I digestion and exchanging the fragment/vector with the similarly digested pT7PVM. PV-MinY was constructed by digesting the PV-MinXY construct with *Bsm* I and swapping this fragment with the *Bsm* I fragment for a digested pT7PVM. Plasmid transformation and amplification were all performed in *Escherichia coli* DH5.

**In vitro Transcription and RNA transfection**. 1.5 g of plasmid DNA was linearized with *EcoR* I and then transcribed by T7 RNA polymerase driven by a T7 promoter upstream of the cDNA for 2 hours at 37C (S*3*). 1 g of transcript RNA was transfected into 1 x 106 HeLa R19 cells using a modified DEAE-Dextran method (S*3*). These cells

were then incubated at room-temperature (RT) for 30 minutes after which the transfection supernatant was replaced with Dulbecco’s modified Eagle medium (DMEM) containing 2% bovine calf serum (BCS). The cells were then incubated at 37 C and observed (up to 4 days) for the onset of cytopathic effect (CPE).

**Cells, virus, virus amplification, plaque assay, and one-step growth curves.** HeLa R19 cells were maintained as a monolayer in DMEM containing 10% BCS. Viruses were amplified on 1.0 x 108 HeLa R19 cell monolayers infected at a multiplicity of infection (MOI) of 1. Infected cells were incubated at 37C in DMEM with 2% BCS for three days or until CPE was observed. After three freeze/thaw cycles cell debris was removed form the lysates via low speed centrifugation and the supernatant containing virus was used for further experiments.

One-Step growth curves were obtained by infecting a monolayer of HeLa R19 cells with 2 MOI of a given virus. Excess inoculums was removed after 30 min after which the cells were washed 2x with PBS and incubated at 37C for 0, 2, 4, 7, 10, 24, and 48 hours. Virus produced at these time points was quantified after 72 hours by plaque assays on HeLa cell monolayers.

**Heat stability and passaging**. The thermal stability of the synthetic viruses, PV-MinXY and PV-Min Z, was tested and compared to the wt virus PV(M). This was done by heating 1x 108 particles suspended in PBS at 50C for 5, 15, 30 and, 60 minutes followed by plaque assays to measure the decrease of infectious virus at the different time points (Fig. S2). In order to test the genetic stability of the synthetic portions of the P1 region of

PV-MinXY and PV-MinZ, viruses were serial passaged and their genomes were sequenced. Briefly, monolayers of 1x106 HeLa R19 cells were infected with 0.5 MOI of PV-MinXY and PV-MinZ and incubated until CPE was clearly visible. Throughout passages, the time interval until CPE developed, remained constant. Finally, the titers and nucleotide sequences of viruses that emerged after passage 5, 9, 15, 17 and 19 was determined (data not shown).

**Virus Purification and determination of viral particles via OD260 absorbance.** A monolayer of HeLa R19 cells on a 15 cm dish (1 x108 cells) was infected with wt virus

PV1(M), PV-Max, PV-MinXY or PV-Min Z at an MOI of 1 and incubated until CPE was observed. After three freeze/thaw cycles the cell lysates were subjected to two centrifugations at 3,000 x g for 15 minutes and then to one centrifugation at 10,000 x g for 15 minutes. 10 g/ml of RNAse A was added to the supernatants of the second centrifugation to destroy free RNA. After an incubation at room temperature for 1 hour the supernantants were gently mixed with sodium dodecyl sulfate (SDS) and EDTA at final concentrations of 0.5 % and 2 mM, respectively, followed by incubation at room temperature for 30 minutes (S*4*). Only properly formed, intact virus particles survive this treatment (S*5*). These supernatants were placed above a 6ml sucrose cushion [30% sucrose in Hank’s Buffered Salt Solution (HBSS)] and virus particles were sedimented by ultracentrifugation for 3.5 hours at 28,000 rpm using an SW28 swing-bucket rotor (S*4*).

After centrifugation, the supernatant above the sucrose cushion was removed and the tube was rinsed two times with HBBS without disturbing the sucrose cushion. The sucrose was then gently removed and the virus pellet at the bottom was re-suspended in

PBS containing 0.1% SDS (*4*). Viral titers were determined via plaque assay see (above). Virus particle concentration was determined via the average of three measurements of the optical density at 260nm of the solution via the NanoDrop spectrophotometer (NanoDrop Technologies) using the formula 9.4 x 1012 particles/ml = 1 OD260 unit (S*4, 6*)

**Dicistronic reporter construction, and in vivo translation.** The dicistronic reporter replicons were all constructed based upon pdiLuc-PV (S*4*). PV-Max and PV-Min capsid regions were amplified via PCR using the oligonucleotides P1max-2A-RI (+)/P1max-2A- RI (-) or P1min-2A-RI (+)/P1min-2A-RI (-) respectively. The PCR fragment was gel purified and then inserted into an intermediate vector pCR-®-XL-TOPO® (Invitrogen Corp.). This intermediate vector was then amplified in One Shot® TOP10 chemically competent cells (Invitrogen Corp.). After preparation of the plasmid using Qiagen miniprep columns (Qiagen, Hilden Germany), the intermediate vectors containing PV- Min were digested with EcoRI and these fragments were ligated into the pdiLuc-PV vector that was equally digested with *EcoR* I (S*4*). These plasmids were also amplified in One Shot® TOP10 chemically competent cells. To construct pdiLuc-PV-MinXY and pdiLuc-PV-MinZ, pdiLuc-PV and pdiLuc-PV-Min each were digested with NheI and the resulting restriction fragments were exchanged between the respective vectors. These were then transformed into One Shot® TOP10 chemically competent cells and amplified. From all four of these clones RNA was in vitro transcribed as described above.

To analyze the in vivo translation efficiency of the synthetic region encoding the poliovirus capsids the RNAs of the dicistronic reporter constructs each were transfected into 2 x 105 HeLa R19 cells on 12-well dishes using Lipofectamine 2000 (Invitrogen

Corp.). In order to quantify the translation of only the input RNA transfections were carried out in the presence of 2 mM guanidine hydrochloride (GnHCL), a potent and specific inhibitor of poliovirus RNA replication. Six hours after transfection cells were lysed in passive lysis buffer (Promega, Madison, WI) and these lysates were analyzed by a dual firefly (F-Luc) *Renilla* (R-Luc) luciferase assay (Promega).

**Oligonucleotides.** The following oligonucleotides were utilized to perform PCR: P1max-2A-RI(+), 5’ CAAGAATTCCTGACCACATACGGAGCTCAAGTATCTTCACAAAAAGTTGG-3’; P1max-2A-RI(-), 5’ TTCGAATTCTCCGTACGTGGTGAGGTCTTTGGTGGACAAAGG-3’; P1min-2A- RI(+), 5’CAAGAATTCCTGACCACATACGGAGCTCAGGTGTCATCCCAAAAAGTAGG-

3’; P1min-2A-RI(-), 5’ TTCGAATTCTCCGTACGTCGTAAGGTCTTTCGTTGACAGTGG-3’.

**CD155tg mice: neuropathogenicity, vaccination, serum conversion.** Groups of 4-6, 6- 8 week old *CD155* tg mice (Tg21 strain) were injected intracerebrally with purified virus ranging from 102 particles to 109 particles in 30 ul PBS to determine neuropathogenicity (S*7*). The lethal dose 50 (LD50) was calculated according to the method by the Reed and Muench (S*8*). Viral titers in the spinal cord and brain were quantified by plaque assay (data not shown).

To test PV-Min Z and PV-MinXY as a vaccine, three doses (108 particles in 100ul of PBS) of these viruses were administered to 6-8 week old CD155tg mice via intraperitoneal injection once a week for three weeks. In parallel, a set of control mice received three mock vaccinations with 100 ul PBS. One week after the final vaccination, 30 ul of blood was extracted from the tail vein and subjected to low speed centrifugation after which the serum harvested (S*9*). Neutralizing antibodies against wt PV(M) in these sera were analyzed via micro-neutralization assay with 100 plaque forming units (PFU) of challenge virus, performed according to the recommendations of WHO (S*9, 10*). Two weeks after the final inoculations, the vaccinated and control mice were challenged with 106 PFU (a lethal dose) of wt PV(M) by intramuscular injection (*9*). All experiments utilizing CD155tg mice were undertaken in compliance with Stony Brook University’s IACUC regulations as well as federal guidelines.

**Determination of RNA folding energies, exclusion of large (100bp) stable secondary structures.** To ensure that strong secondary structures do not affect translation efficiency, we scanned the capsid region of our designs using the program mfold (S11). We concentrated our search on 100-base long segments, having 80 bases overlap with

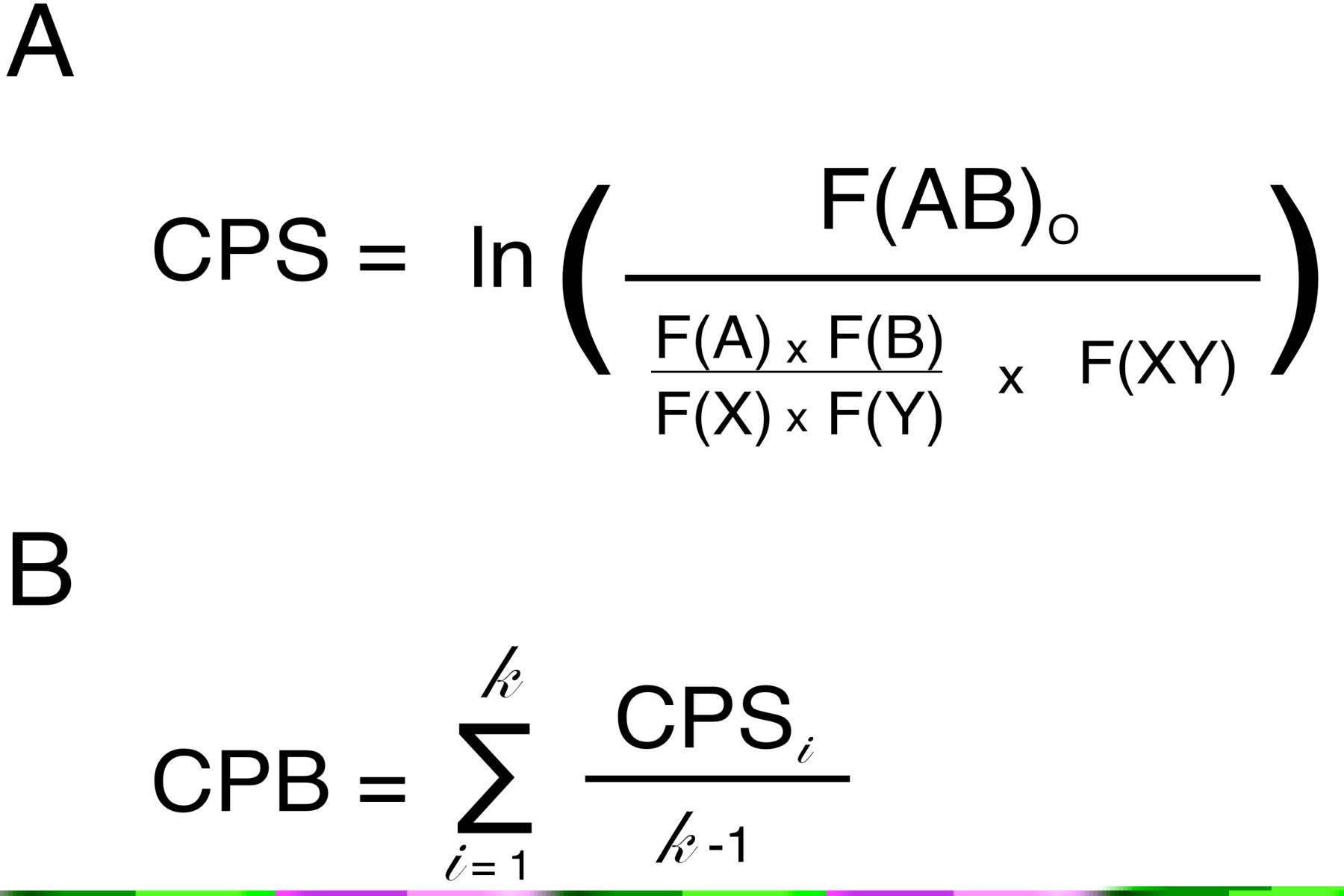
each other. Any segments with lower binding energy than a threshold of －30Kcal/mol

would incur random synonymous substitutions at C － G binding locations, such that the

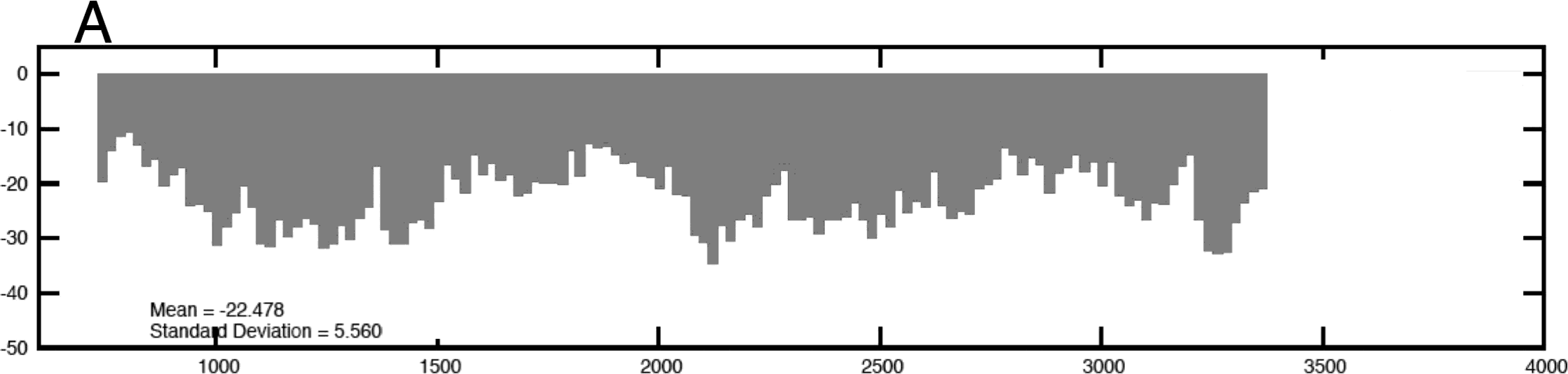
binding energy of the segment could be elevated. The synonymous changes would be selected in such a way that the codon pair bias objective would be satisfied as well.

**Supporting Information.** [The GenBank (http://www.ncbi.nlm.nih.gov/Genbank/)](http://www.ncbi.nlm.nih.gov/Genbank/)) accession numbers for the codon-pair bias sequences presented in this paper are: P1-Min (EU095953) and P1-Max (EU095952).

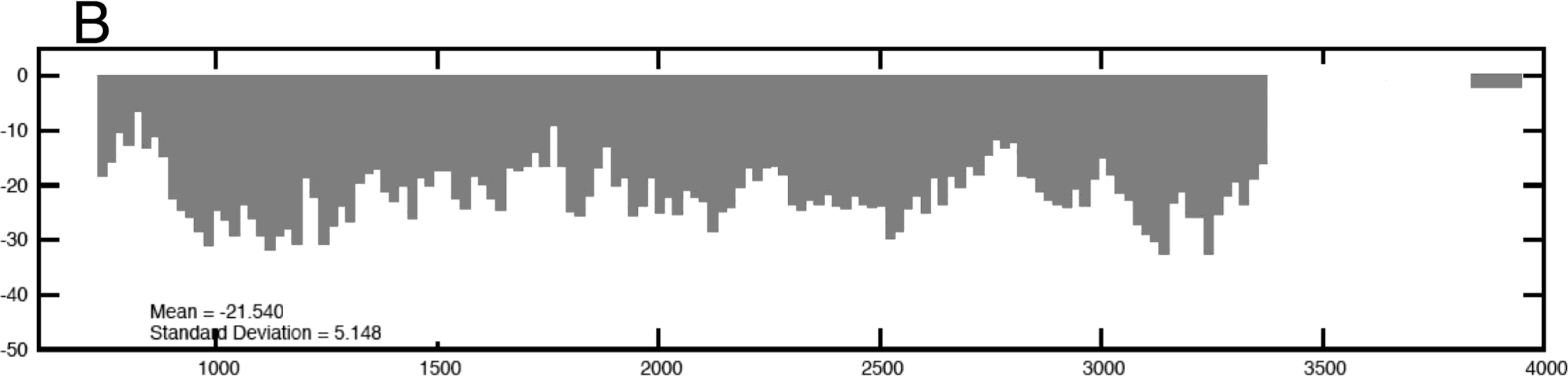
**Supplementary Figures**



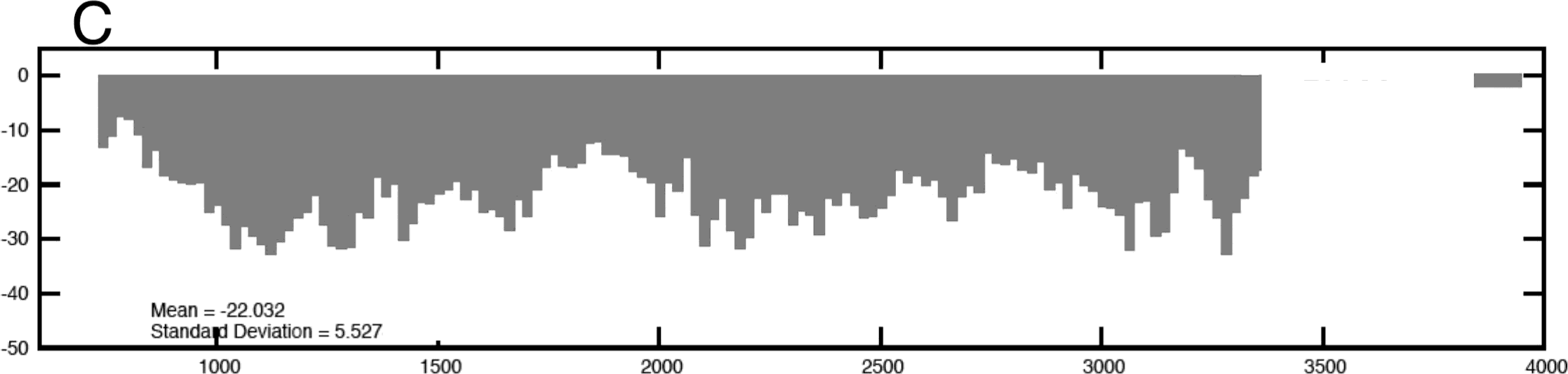
**Figure S1**. **Equations used to determine codon-pair scores (CPS) and the codon- pair bias (CPB) of an entire open reading frame (ORF).** (A) The equation used to calculate the CPS of a given codon pair independent of codon usage and amino acid bias, thus its relative expected frequency, where the codon pair AB encodes for amino acid pair XY and F denotes frequency (number of occurrences). This CPS score for a given pair determines if the pair is over-represented (+) or under-represented (-) in the human genome. (B) The equation used to calculate the CPB for an entire gene. CPB is the arithmetic mean of the individual codon pair scores of all pairs making up the ORF.



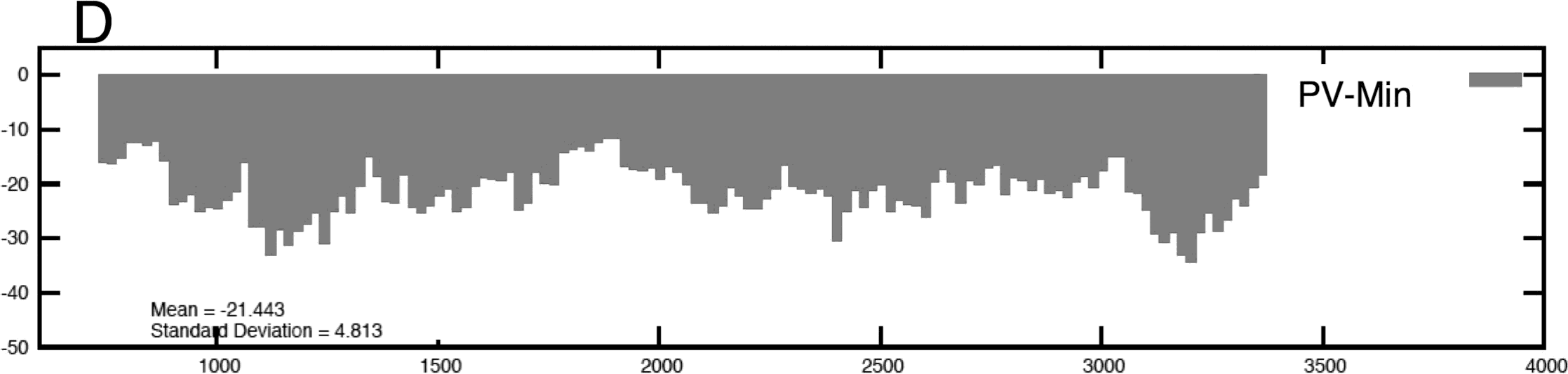
PV(M)-wt "



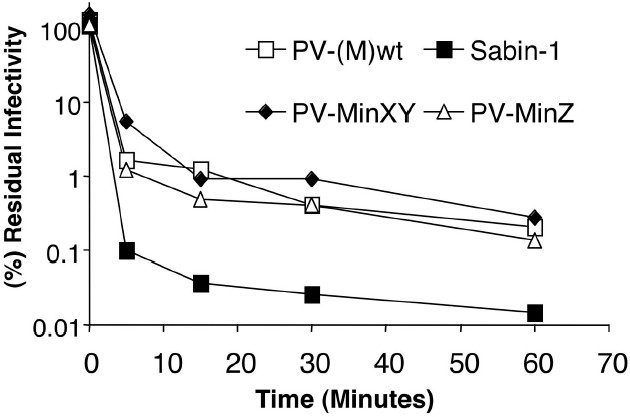
PV-SD



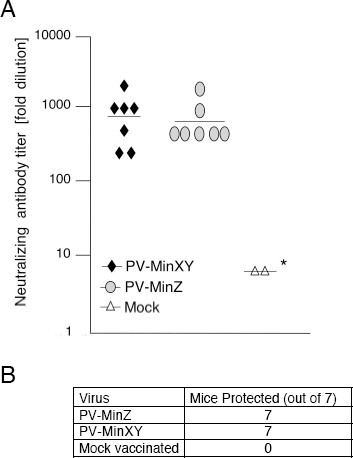
PV-Max



**Figure S2. Synthetic P1s have similar folding energy to wild-type, ensuring absences of large, stable secondary RNA structure**. To ensure that strong secondary structures do not affect translation efficiency, we scanned the capsid region of our designs using the program mFold (S11). We concentrated our search on 100-base long segments, having 80 bases overlap with each other. Any segments with lower binding energy than a threshold of -30Kcal/mol would incur random synonymous substitutions at C - G binding locations, such that the binding energy of the segment could be elevated. The synonymous changes would be selected in such a way that the codon pair bias objective would be satisfied as well. Nevertheless, only a few changes resulted thus altering the original codon pair selections of our algorithm. All constructs thus have a similar mean folding energy (A) PV(M)-wt, mean -22.478, (B) PV-SD, mean -21.540, (C) PV-Max, mean -22.032, (D) PV-Min, mean -21.443.



**Figure S3.** The heat inactivation profile of the synthetic viruses is unchanged. To rule out that large scale codon-pair bias modification alters the gross morphology of virions, as one might expect if capsid proteins were misfolded, the thermal stability of PV-MinXY and PV-MinZ was tested. An equal number of particles were incubated at 50°C and the remaining infectivity quantified after given periods of time via plaque assay. If the capsids of the synthetic viruses were destabilized we would expect increased loss of viability at 50°C in comparison to PV(M)-wt. This was not the case. The thermal inactivation kinetics of both synthetic viruses was identical to the wt. In contrast, the Sabin-1 virus carries numerous mutations in the genome region encoding the capsid , which, fittingly, rendered this virus less heat stabile as compared to wt PV1(M).



**Figure S4.** Induction of neutralizing antibodies by PV-MinZ and PV-MinXY and protection after challenge. Since PV-MinZ and PV-MinXY encode exactly the same proteins as wild-type virus, they might provoke a protective immune response. Alternatively, the relatively poor translation of the mutant mRNAs might prevent such a response. To distinguish these possibilities, PV-MinZ and PV- MinXY were administered to groups of eight *CD155*tg mice at a dose of 108 particles once a week for three weeks via intraperitoneal injection. (A) Ten days after the final injection the protective antibodies of the seven surviving mice in each group were measured via micro-neutralization assay, and a robust immune response was detected, as indicated (878 for PV-MinXY, 805 for PV-MinZ) (S*9, 10*). (B) Subsequent challenge of the vaccinated mice with an otherwise lethal dose of wild-type poliovirus via intramuscular injection did not lead to death or signs of paralysis or paresia; in contrast, all mock vaccinated mice succumbed to challenge. (\*) No virus neutralization for mock-vaccinated animals was detected at the lowest tested dilution of 1:8.

# Supplementary Tables

**Table S1**. Calculated codon pair scores (CPS) for all 3721 possible codon pair combinations (excluding Stop codons) in the human ORFeome. Column A, amino acid pair; Column B, codon pair; Column C, expected number of occurrences of the codon pair within the human ORFeome; Column D, observed number of occurrences of this codon pair within the ORFeome; Column E, ratio of observed occurrences over expected occurrences; Column F, the natural log of the ratio in column E corresponds to the codon pair score (CPS) for the codon pair in column B.

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **AA pair** | **Codon pair** | **Expected** | **Observed** | **Observed/Expected** | **CPS** |
| AA | GCGGCG | 630.04 | 2870 | 4.555 | **1.516** |
| AA | GCGGCC | 2330.20 | 4032 | 1.730 | **0.548** |
| AA | GCTGCT | 3727.41 | 5562 | 1.492 | **0.400** |
| AA | GCAGCA | 2856.40 | 4196 | 1.469 | **0.385** |
| AA | GCAGCT | 3262.97 | 4711 | 1.444 | **0.367** |
| AA | GCTGCA | 3262.97 | 4357 | 1.335 | **0.289** |
| AA | GCTGCC | 5667.77 | 7014 | 1.238 | **0.213** |
| AA | GCAGCC | 4961.56 | 6033 | 1.216 | **0.196** |
| AA | GCAGCG | 1341.51 | 1420 | 1.059 | **0.057** |
| AA | GCTGCG | 1532.46 | 1533 | 1.000 | **0.000** |
| AA | GCGGCT | 1532.46 | 1472 | 0.961 | **-0.040** |
| AA | GCCGCG | 2330.20 | 2042 | 0.876 | **-0.132** |
| AA | GCGGCA | 1341.51 | 1142 | 0.851 | **-0.161** |
| AA | GCCGCC | 8618.21 | 5141 | 0.597 | **-0.517** |
| AA | GCCGCT | 5667.77 | 1378 | 0.243 | **-1.414** |
| AA | GCCGCA | 4961.56 | 1122 | 0.226 | **-1.487** |
| AC | GCCTGC | 2333.61 | 3975 | 1.703 | **0.533** |
| AC | GCCTGT | 1965.56 | 2436 | 1.239 | **0.215** |
| AC | GCGTGC | 630.96 | 560 | 0.888 | **-0.119** |
| AC | GCTTGT | 1292.65 | 1142 | 0.883 | **-0.124** |
| AC | GCATGT | 1131.59 | 881 | 0.779 | **-0.250** |
| AC | GCGTGT | 531.45 | 322 | 0.606 | **-0.501** |
| AC | GCTTGC | 1534.70 | 894 | 0.583 | **-0.540** |
| AC | GCATGC | 1343.47 | 554 | 0.412 | **-0.886** |
| AD | GCAGAT | 2373.33 | 4215 | 1.776 | **0.574** |
| AD | GCTGAT | 2711.15 | 3887 | 1.434 | **0.360** |
| AD | GCTGAC | 3062.55 | 4374 | 1.428 | **0.356** |
| AD | GCGGAC | 1259.11 | 1625 | 1.291 | **0.255** |
| AD | GCAGAC | 2680.95 | 3395 | 1.266 | **0.236** |
| AD | GCGGAT | 1114.64 | 839 | 0.753 | **-0.284** |
| AD | GCCGAC | 4656.80 | 2726 | 0.585 | **-0.535** |
| AD | GCCGAT | 4122.47 | 920 | 0.223 | **-1.500** |
| AE | GCAGAA | 3517.48 | 5814 | 1.653 | **0.503** |
| AE | GCAGAG | 4703.98 | 7094 | 1.508 | **0.411** |
| AE | GCGGAG | 2209.23 | 3171 | 1.435 | **0.361** |
| AE | GCTGAG | 5373.53 | 7362 | 1.370 | **0.315** |
| AE | GCTGAA | 4018.14 | 5186 | 1.291 | **0.255** |
| AE | GCCGAG | 8170.80 | 5082 | 0.622 | **-0.475** |
| AE | GCGGAA | 1651.99 | 949 | 0.574 | **-0.554** |
| AE | GCCGAA | 6109.85 | 1097 | 0.180 | **-1.717** |
| AF | GCCTTC | 4447.90 | 7382 | 1.660 | **0.507** |
| AF | GCATTT | 2237.22 | 2332 | 1.042 | **0.041** |
| AF | GCTTTT | 2555.66 | 2580 | 1.010 | **0.009** |
| AF | GCCTTT | 3886.04 | 3842 | 0.989 | **-0.011** |
| AF | GCTTTC | 2925.16 | 2315 | 0.791 | **-0.234** |
| AF | GCGTTC | 1202.63 | 636 | 0.529 | **-0.637** |
| AF | GCGTTT | 1050.71 | 518 | 0.493 | **-0.707** |
| AF | GCATTC | 2560.68 | 1261 | 0.492 | **-0.708** |
| AG | GCGGGC | 1369.64 | 2638 | 1.926 | **0.655** |
| AG | GCGGGG | 986.17 | 1738 | 1.762 | **0.567** |
| AG | GCTGGG | 2398.67 | 3855 | 1.607 | **0.474** |
| AG | GCTGGT | 1590.73 | 2524 | 1.587 | **0.462** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| AG | GCTGGA | 2457.02 | 3783 | 1.540 | **0.432** |
| AG | GCAGGA | 2150.87 | 3074 | 1.429 | **0.357** |
| AG | GCAGGG | 2099.79 | 2782 | 1.325 | **0.281** |
| AG | GCAGGT | 1392.52 | 1748 | 1.255 | **0.227** |
| AG | GCTGGC | 3331.38 | 3961 | 1.189 | **0.173** |
| AG | GCAGGC | 2916.28 | 3119 | 1.070 | **0.067** |
| AG | GCGGGT | 654.00 | 617 | 0.943 | **-0.058** |
| AG | GCGGGA | 1010.16 | 793 | 0.785 | **-0.242** |
| AG | GCCGGG | 3647.33 | 2240 | 0.614 | **-0.488** |
| AG | GCCGGC | 5065.58 | 2977 | 0.588 | **-0.532** |
| AG | GCCGGT | 2418.80 | 581 | 0.240 | **-1.426** |
| AG | GCCGGA | 3736.06 | 795 | 0.213 | **-1.547** |
| AH | GCGCAC | 748.29 | 983 | 1.314 | **0.273** |
| AH | GCCCAC | 2767.53 | 3465 | 1.252 | **0.225** |
| AH | GCTCAT | 1319.86 | 1471 | 1.115 | **0.108** |
| AH | GCACAT | 1155.40 | 1122 | 0.971 | **-0.029** |
| AH | GCCCAT | 2006.93 | 1827 | 0.910 | **-0.094** |
| AH | GCTCAC | 1820.07 | 1526 | 0.838 | **-0.176** |
| AH | GCACAC | 1593.29 | 1312 | 0.823 | **-0.194** |
| AH | GCGCAT | 542.64 | 248 | 0.457 | **-0.783** |
| AI | GCCATC | 3894.51 | 7798 | 2.002 | **0.694** |
| AI | GCCATT | 3079.73 | 3761 | 1.221 | **0.200** |
| AI | GCAATA | 815.43 | 924 | 1.133 | **0.125** |
| AI | GCAATT | 1773.02 | 1684 | 0.950 | **-0.052** |
| AI | GCCATA | 1416.41 | 1257 | 0.887 | **-0.119** |
| AI | GCTATT | 2025.39 | 1709 | 0.844 | **-0.170** |
| AI | GCTATA | 931.50 | 771 | 0.828 | **-0.189** |
| AI | GCTATC | 2561.23 | 1194 | 0.466 | **-0.763** |
| AI | GCGATT | 832.70 | 373 | 0.448 | **-0.803** |
| AI | GCAATC | 2242.09 | 984 | 0.439 | **-0.824** |
| AI | GCGATA | 382.97 | 149 | 0.389 | **-0.944** |
| AI | GCGATC | 1053.00 | 404 | 0.384 | **-0.958** |
| AK | GCCAAG | 5767.01 | 9818 | 1.702 | **0.532** |
| AK | GCAAAA | 2563.57 | 3011 | 1.175 | **0.161** |
| AK | GCCAAA | 4452.91 | 4794 | 1.077 | **0.074** |
| AK | GCAAAG | 3320.10 | 3044 | 0.917 | **-0.087** |
| AK | GCTAAA | 2928.46 | 2022 | 0.690 | **-0.370** |
| AK | GCGAAG | 1559.29 | 765 | 0.491 | **-0.712** |
| AK | GCTAAG | 3792.68 | 1725 | 0.455 | **-0.788** |
| AK | GCGAAA | 1203.98 | 409 | 0.340 | **-1.080** |
| AL | GCGCTG | 2369.16 | 4619 | 1.950 | **0.668** |
| AL | GCGCTC | 1140.05 | 1765 | 1.548 | **0.437** |
| AL | GCTTTG | 1873.51 | 2601 | 1.388 | **0.328** |
| AL | GCCCTG | 8762.30 | 11409 | 1.302 | **0.264** |
| AL | GCCTTG | 2848.79 | 3695 | 1.297 | **0.260** |
| AL | GCTTTA | 1115.24 | 1385 | 1.242 | **0.217** |
| AL | GCCCTC | 4216.45 | 4499 | 1.067 | **0.065** |
| AL | GCTCTT | 1912.07 | 2038 | 1.066 | **0.064** |
| AL | GCATTA | 976.28 | 986 | 1.010 | **0.010** |
| AL | GCTCTA | 1031.16 | 940 | 0.912 | **-0.093** |
| AL | GCACTT | 1673.82 | 1444 | 0.863 | **-0.148** |
| AL | GCATTG | 1640.07 | 1364 | 0.832 | **-0.184** |
| AL | GCACTA | 902.68 | 747 | 0.828 | **-0.189** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| AL | GCGCTA | 423.94 | 342 | 0.807 | **-0.215** |
| AL | GCCCTA | 1567.95 | 1228 | 0.783 | **-0.244** |
| AL | GCTCTG | 5762.53 | 4505 | 0.782 | **-0.246** |
| AL | GCCCTT | 2907.42 | 2230 | 0.767 | **-0.265** |
| AL | GCTCTC | 2772.95 | 2036 | 0.734 | **-0.309** |
| AL | GCCTTA | 1695.80 | 1205 | 0.711 | **-0.342** |
| AL | GCACTG | 5044.51 | 3522 | 0.698 | **-0.359** |
| AL | GCGTTG | 770.26 | 476 | 0.618 | **-0.481** |
| AL | GCGCTT | 786.11 | 459 | 0.584 | **-0.538** |
| AL | GCACTC | 2427.43 | 1415 | 0.583 | **-0.540** |
| AL | GCGTTA | 458.51 | 169 | 0.369 | **-0.998** |
| AM | GCCATG | 4236.47 | 6521 | 1.539 | **0.431** |
| AM | GCAATG | 2438.96 | 1900 | 0.779 | **-0.250** |
| AM | GCTATG | 2786.11 | 1561 | 0.560 | **-0.579** |
| AM | GCGATG | 1145.46 | 625 | 0.546 | **-0.606** |
| AN | GCCAAC | 3190.28 | 5452 | 1.709 | **0.536** |
| AN | GCAAAT | 1667.60 | 2282 | 1.368 | **0.314** |
| AN | GCCAAT | 2896.62 | 3122 | 1.078 | **0.075** |
| AN | GCAAAC | 1836.66 | 1512 | 0.823 | **-0.195** |
| AN | GCTAAT | 1904.97 | 1356 | 0.712 | **-0.340** |
| AN | GCTAAC | 2098.09 | 925 | 0.441 | **-0.819** |
| AN | GCGAAC | 862.59 | 331 | 0.384 | **-0.958** |
| AN | GCGAAT | 783.19 | 260 | 0.332 | **-1.103** |
| AP | GCGCCG | 406.74 | 1172 | 2.881 | **1.058** |
| AP | GCGCCC | 1122.56 | 2271 | 2.023 | **0.705** |
| AP | GCCCCG | 1504.34 | 2335 | 1.552 | **0.440** |
| AP | GCTCCA | 2360.19 | 2463 | 1.044 | **0.043** |
| AP | GCTCCT | 2445.47 | 2548 | 1.042 | **0.041** |
| AP | GCCCCC | 4151.78 | 3957 | 0.953 | **-0.048** |
| AP | GCACCT | 2140.76 | 2028 | 0.947 | **-0.054** |
| AP | GCCCCA | 3588.82 | 3371 | 0.939 | **-0.063** |
| AP | GCACCA | 2066.10 | 1831 | 0.886 | **-0.121** |
| AP | GCACCC | 2390.20 | 2111 | 0.883 | **-0.124** |
| AP | GCCCCT | 3718.49 | 3269 | 0.879 | **-0.129** |
| AP | GCTCCC | 2730.42 | 2384 | 0.873 | **-0.136** |
| AP | GCTCCG | 989.33 | 773 | 0.781 | **-0.247** |
| AP | GCGCCT | 1005.41 | 778 | 0.774 | **-0.256** |
| AP | GCACCG | 866.06 | 571 | 0.659 | **-0.417** |
| AP | GCGCCA | 970.35 | 595 | 0.613 | **-0.489** |
| AQ | GCCCAG | 7143.67 | 9550 | 1.337 | **0.290** |
| AQ | GCGCAG | 1931.51 | 2101 | 1.088 | **0.084** |
| AQ | GCACAA | 1472.79 | 1416 | 0.961 | **-0.039** |
| AQ | GCTCAA | 1682.42 | 1522 | 0.905 | **-0.100** |
| AQ | GCTCAG | 4698.04 | 4141 | 0.881 | **-0.126** |
| AQ | GCACAG | 4112.65 | 3374 | 0.820 | **-0.198** |
| AQ | GCCCAA | 2558.23 | 1943 | 0.760 | **-0.275** |
| AQ | GCGCAA | 691.70 | 244 | 0.353 | **-1.042** |
| AR | GCGCGC | 580.17 | 1255 | 2.163 | **0.772** |
| AR | GCGCGG | 634.54 | 1175 | 1.852 | **0.616** |
| AR | GCCCGG | 2346.82 | 3946 | 1.681 | **0.520** |
| AR | GCCCGC | 2145.76 | 3135 | 1.461 | **0.379** |
| AR | GCCAGG | 2323.57 | 3242 | 1.395 | **0.333** |
| AR | GCAAGA | 1362.59 | 1559 | 1.144 | **0.135** |

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| --- | --- | --- | --- | --- | --- |
| AR | GCTCGA | 836.64 | 943 | 1.127 | **0.120** |
| AR | GCCCGA | 1272.16 | 1418 | 1.115 | **0.109** |
| AR | GCCCGT | 918.67 | 935 | 1.018 | **0.018** |
| AR | GCTCGT | 604.17 | 595 | 0.985 | **-0.015** |
| AR | GCCAGA | 2366.81 | 2219 | 0.938 | **-0.064** |
| AR | GCTCGG | 1543.39 | 1295 | 0.839 | **-0.175** |
| AR | GCGCGT | 248.39 | 205 | 0.825 | **-0.192** |
| AR | GCAAGG | 1337.69 | 1089 | 0.814 | **-0.206** |
| AR | GCGAGG | 628.25 | 486 | 0.774 | **-0.257** |
| AR | GCACGA | 732.39 | 533 | 0.728 | **-0.318** |
| AR | GCTCGC | 1411.16 | 941 | 0.667 | **-0.405** |
| AR | GCGCGA | 343.97 | 226 | 0.657 | **-0.420** |
| AR | GCACGT | 528.89 | 338 | 0.639 | **-0.448** |
| AR | GCACGG | 1351.08 | 859 | 0.636 | **-0.453** |
| AR | GCACGC | 1235.33 | 619 | 0.501 | **-0.691** |
| AR | GCTAGA | 1556.53 | 714 | 0.459 | **-0.779** |
| AR | GCGAGA | 639.94 | 263 | 0.411 | **-0.889** |
| AR | GCTAGG | 1528.10 | 487 | 0.319 | **-1.144** |
| AS | GCCTCG | 963.41 | 1977 | 2.052 | **0.719** |
| AS | GCGTCG | 260.49 | 465 | 1.785 | **0.579** |
| AS | GCCAGC | 4127.58 | 6466 | 1.567 | **0.449** |
| AS | GCCTCC | 3643.21 | 5443 | 1.494 | **0.401** |
| AS | GCTTCT | 2084.25 | 2488 | 1.194 | **0.177** |
| AS | GCCAGT | 2604.12 | 3085 | 1.185 | **0.169** |
| AS | GCATCT | 1824.55 | 2154 | 1.181 | **0.166** |
| AS | GCTTCA | 1684.99 | 1932 | 1.147 | **0.137** |
| AS | GCGTCC | 985.05 | 1079 | 1.095 | **0.091** |
| AS | GCATCA | 1475.04 | 1531 | 1.038 | **0.037** |
| AS | GCCTCT | 3169.23 | 3235 | 1.021 | **0.021** |
| AS | GCCTCA | 2562.14 | 2514 | 0.981 | **-0.019** |
| AS | GCTTCC | 2395.96 | 2295 | 0.958 | **-0.043** |
| AS | GCAAGT | 1499.21 | 1307 | 0.872 | **-0.137** |
| AS | GCTTCG | 633.59 | 516 | 0.814 | **-0.205** |
| AS | GCATCC | 2097.42 | 1658 | 0.790 | **-0.235** |
| AS | GCATCG | 554.64 | 403 | 0.727 | **-0.319** |
| AS | GCGTCT | 856.90 | 521 | 0.608 | **-0.498** |
| AS | GCGAGC | 1116.02 | 595 | 0.533 | **-0.629** |
| AS | GCGTCA | 692.75 | 319 | 0.460 | **-0.775** |
| AS | GCAAGC | 2376.27 | 1080 | 0.454 | **-0.789** |
| AS | GCTAGT | 1712.60 | 737 | 0.430 | **-0.843** |
| AS | GCGAGT | 704.10 | 265 | 0.376 | **-0.977** |
| AS | GCTAGC | 2714.51 | 673 | 0.248 | **-1.395** |
| AT | GCCACG | 1262.40 | 2478 | 1.963 | **0.674** |
| AT | GCCACC | 3842.98 | 6598 | 1.717 | **0.541** |
| AT | GCCACA | 3111.04 | 4031 | 1.296 | **0.259** |
| AT | GCCACT | 2751.18 | 3205 | 1.165 | **0.153** |
| AT | GCAACA | 1791.05 | 1761 | 0.983 | **-0.017** |
| AT | GCGACG | 341.33 | 329 | 0.964 | **-0.037** |
| AT | GCAACT | 1583.87 | 1509 | 0.953 | **-0.048** |
| AT | GCTACT | 1809.31 | 1395 | 0.771 | **-0.260** |
| AT | GCTACA | 2045.98 | 1528 | 0.747 | **-0.292** |
| AT | GCGACC | 1039.07 | 601 | 0.578 | **-0.547** |
| AT | GCAACC | 2212.43 | 1259 | 0.569 | **-0.564** |

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| --- | --- | --- | --- | --- | --- |
| AT | GCTACC | 2527.34 | 1364 | 0.540 | **-0.617** |
| AT | GCAACG | 726.77 | 384 | 0.528 | **-0.638** |
| AT | GCTACG | 830.22 | 363 | 0.437 | **-0.827** |
| AT | GCGACT | 743.87 | 308 | 0.414 | **-0.882** |
| AT | GCGACA | 841.17 | 347 | 0.413 | **-0.885** |
| AV | GCTGTT | 1736.99 | 3025 | 1.742 | **0.555** |
| AV | GCTGTG | 4399.56 | 7279 | 1.654 | **0.503** |
| AV | GCTGTA | 1127.89 | 1750 | 1.552 | **0.439** |
| AV | GCTGTC | 2223.90 | 3351 | 1.507 | **0.410** |
| AV | GCAGTA | 987.35 | 1401 | 1.419 | **0.350** |
| AV | GCGGTG | 1808.80 | 2487 | 1.375 | **0.318** |
| AV | GCAGTT | 1520.56 | 2087 | 1.373 | **0.317** |
| AV | GCAGTG | 3851.36 | 4349 | 1.129 | **0.122** |
| AV | GCGGTC | 914.32 | 883 | 0.966 | **-0.035** |
| AV | GCAGTC | 1946.80 | 1806 | 0.928 | **-0.075** |
| AV | GCCGTG | 6689.81 | 4322 | 0.646 | **-0.437** |
| AV | GCGGTT | 714.13 | 423 | 0.592 | **-0.524** |
| AV | GCGGTA | 463.71 | 270 | 0.582 | **-0.541** |
| AV | GCCGTC | 3381.59 | 1798 | 0.532 | **-0.632** |
| AV | GCCGTT | 2641.21 | 563 | 0.213 | **-1.546** |
| AV | GCCGTA | 1715.03 | 329 | 0.192 | **-1.651** |
| AW | GCCTGG | 2528.22 | 3848 | 1.522 | **0.420** |
| AW | GCGTGG | 683.58 | 558 | 0.816 | **-0.203** |
| AW | GCTTGG | 1662.69 | 1066 | 0.641 | **-0.445** |
| AW | GCATGG | 1455.51 | 858 | 0.589 | **-0.529** |
| AY | GCCTAC | 2643.77 | 4073 | 1.541 | **0.432** |
| AY | GCCTAT | 2148.26 | 2457 | 1.144 | **0.134** |
| AY | GCTTAT | 1412.81 | 1478 | 1.046 | **0.045** |
| AY | GCATAT | 1236.77 | 1244 | 1.006 | **0.006** |
| AY | GCTTAC | 1738.68 | 1139 | 0.655 | **-0.423** |
| AY | GCGTAC | 714.83 | 429 | 0.600 | **-0.511** |
| AY | GCATAC | 1522.04 | 868 | 0.570 | **-0.562** |
| AY | GCGTAT | 580.85 | 310 | 0.534 | **-0.628** |
| CA | TGTGCT | 1164.04 | 2021 | 1.736 | **0.552** |
| CA | TGTGCC | 1769.99 | 2992 | 1.690 | **0.525** |
| CA | TGTGCA | 1019.00 | 1708 | 1.676 | **0.517** |
| CA | TGTGCG | 478.57 | 477 | 0.997 | **-0.003** |
| CA | TGCGCG | 568.18 | 502 | 0.884 | **-0.124** |
| CA | TGCGCC | 2101.42 | 1313 | 0.625 | **-0.470** |
| CA | TGCGCT | 1382.00 | 368 | 0.266 | **-1.323** |
| CA | TGCGCA | 1209.80 | 312 | 0.258 | **-1.355** |
| CC | TGCTGC | 1534.17 | 2610 | 1.701 | **0.531** |
| CC | TGCTGT | 1292.21 | 1571 | 1.216 | **0.195** |
| CC | TGTTGT | 1088.41 | 529 | 0.486 | **-0.721** |
| CC | TGTTGC | 1292.21 | 497 | 0.385 | **-0.956** |
| CD | TGTGAC | 1920.20 | 3470 | 1.807 | **0.592** |
| CD | TGTGAT | 1699.87 | 2853 | 1.678 | **0.518** |
| CD | TGCGAC | 2279.75 | 1134 | 0.497 | **-0.698** |
| CD | TGCGAT | 2018.17 | 461 | 0.228 | **-1.477** |
| CE | TGTGAA | 1901.69 | 3636 | 1.912 | **0.648** |
| CE | TGTGAG | 2543.16 | 3935 | 1.547 | **0.437** |
| CE | TGCGAG | 3019.37 | 1709 | 0.566 | **-0.569** |
| CE | TGCGAA | 2257.78 | 442 | 0.196 | **-1.631** |

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| CF | TGCTTC | 1891.74 | 2684 | 1.419 | **0.350** |
| CF | TGCTTT | 1652.78 | 1685 | 1.019 | **0.019** |
| CF | TGTTTT | 1392.11 | 1096 | 0.787 | **-0.239** |
| CF | TGTTTC | 1593.38 | 1065 | 0.668 | **-0.403** |
| CG | TGTGGG | 1594.78 | 3240 | 2.032 | **0.709** |
| CG | TGTGGA | 1633.57 | 2846 | 1.742 | **0.555** |
| CG | TGTGGT | 1057.61 | 1627 | 1.538 | **0.431** |
| CG | TGTGGC | 2214.90 | 3133 | 1.415 | **0.347** |
| CG | TGCGGG | 1893.40 | 1137 | 0.601 | **-0.510** |
| CG | TGCGGC | 2629.63 | 1461 | 0.556 | **-0.588** |
| CG | TGCGGT | 1255.64 | 344 | 0.274 | **-1.295** |
| CG | TGCGGA | 1939.46 | 431 | 0.222 | **-1.504** |
| CH | TGCCAC | 1618.50 | 2144 | 1.325 | **0.281** |
| CH | TGCCAT | 1173.68 | 1253 | 1.068 | **0.065** |
| CH | TGTCAT | 988.58 | 831 | 0.841 | **-0.174** |
| CH | TGTCAC | 1363.24 | 916 | 0.672 | **-0.398** |
| CI | TGCATC | 1821.04 | 2813 | 1.545 | **0.435** |
| CI | TGCATT | 1440.05 | 1579 | 1.096 | **0.092** |
| CI | TGCATA | 662.30 | 576 | 0.870 | **-0.140** |
| CI | TGTATA | 557.84 | 474 | 0.850 | **-0.163** |
| CI | TGTATT | 1212.94 | 927 | 0.764 | **-0.269** |
| CI | TGTATC | 1533.83 | 859 | 0.560 | **-0.580** |
| CK | TGCAAG | 2777.53 | 3348 | 1.205 | **0.187** |
| CK | TGCAAA | 2144.62 | 2441 | 1.138 | **0.129** |
| CK | TGTAAA | 1806.38 | 1770 | 0.980 | **-0.020** |
| CK | TGTAAG | 2339.47 | 1509 | 0.645 | **-0.438** |
| CL | TGCCTC | 1722.14 | 2468 | 1.433 | **0.360** |
| CL | TGCCTG | 3578.83 | 4525 | 1.264 | **0.235** |
| CL | TGTTTA | 583.38 | 704 | 1.207 | **0.188** |
| CL | TGCCTT | 1187.49 | 1384 | 1.165 | **0.153** |
| CL | TGTTTG | 980.04 | 1079 | 1.101 | **0.096** |
| CL | TGCTTG | 1163.55 | 1179 | 1.013 | **0.013** |
| CL | TGTCTT | 1000.21 | 940 | 0.940 | **-0.062** |
| CL | TGCCTA | 640.41 | 585 | 0.913 | **-0.090** |
| CL | TGTCTA | 539.40 | 481 | 0.892 | **-0.115** |
| CL | TGCTTA | 692.62 | 565 | 0.816 | **-0.204** |
| CL | TGTCTC | 1450.53 | 1010 | 0.696 | **-0.362** |
| CL | TGTCTG | 3014.39 | 1633 | 0.542 | **-0.613** |
| CM | TGCATG | 1518.22 | 1979 | 1.304 | **0.265** |
| CM | TGTATG | 1278.78 | 818 | 0.640 | **-0.447** |
| CN | TGCAAC | 1825.04 | 2351 | 1.288 | **0.253** |
| CN | TGCAAT | 1657.05 | 1636 | 0.987 | **-0.013** |
| CN | TGTAAT | 1395.71 | 1349 | 0.967 | **-0.034** |
| CN | TGTAAC | 1537.20 | 1079 | 0.702 | **-0.354** |
| CP | TGCCCG | 687.28 | 978 | 1.423 | **0.353** |
| CP | TGCCCC | 1896.80 | 2279 | 1.201 | **0.184** |
| CP | TGCCCA | 1639.61 | 1728 | 1.054 | **0.053** |
| CP | TGCCCT | 1698.85 | 1690 | 0.995 | **-0.005** |
| CP | TGTCCT | 1430.91 | 1333 | 0.932 | **-0.071** |
| CP | TGTCCA | 1381.01 | 1263 | 0.915 | **-0.089** |
| CP | TGTCCC | 1597.65 | 1369 | 0.857 | **-0.154** |
| CP | TGTCCG | 578.88 | 271 | 0.468 | **-0.759** |
| CQ | TGCCAG | 3338.89 | 4321 | 1.294 | **0.258** |

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| --- | --- | --- | --- | --- | --- |
| CQ | TGCCAA | 1195.69 | 1319 | 1.103 | **0.098** |
| CQ | TGTCAA | 1007.11 | 905 | 0.899 | **-0.107** |
| CQ | TGTCAG | 2812.30 | 1809 | 0.643 | **-0.441** |
| CR | TGCCGC | 1031.52 | 1860 | 1.803 | **0.590** |
| CR | TGCCGG | 1128.18 | 1543 | 1.368 | **0.313** |
| CR | TGCAGG | 1117.00 | 1450 | 1.298 | **0.261** |
| CR | TGCCGT | 441.63 | 541 | 1.225 | **0.203** |
| CR | TGCCGA | 611.56 | 742 | 1.213 | **0.193** |
| CR | TGCAGA | 1137.78 | 1252 | 1.100 | **0.096** |
| CR | TGTCGA | 515.11 | 458 | 0.889 | **-0.118** |
| CR | TGTCGT | 371.98 | 308 | 0.828 | **-0.189** |
| CR | TGTAGA | 958.34 | 570 | 0.595 | **-0.520** |
| CR | TGTCGC | 868.83 | 497 | 0.572 | **-0.559** |
| CR | TGTCGG | 950.24 | 463 | 0.487 | **-0.719** |
| CR | TGTAGG | 940.83 | 389 | 0.413 | **-0.883** |
| CS | TGCAGC | 1990.73 | 3150 | 1.582 | **0.459** |
| CS | TGCTCC | 1757.12 | 2397 | 1.364 | **0.311** |
| CS | TGCAGT | 1255.97 | 1701 | 1.354 | **0.303** |
| CS | TGCTCG | 464.65 | 571 | 1.229 | **0.206** |
| CS | TGTTCT | 1287.45 | 1184 | 0.920 | **-0.084** |
| CS | TGCTCT | 1528.52 | 1393 | 0.911 | **-0.093** |
| CS | TGTTCA | 1040.83 | 932 | 0.895 | **-0.110** |
| CS | TGCTCA | 1235.72 | 1079 | 0.873 | **-0.136** |
| CS | TGTTCC | 1479.99 | 1102 | 0.745 | **-0.295** |
| CS | TGTAGT | 1057.88 | 699 | 0.661 | **-0.414** |
| CS | TGTTCG | 391.37 | 192 | 0.491 | **-0.712** |
| CS | TGTAGC | 1676.76 | 767 | 0.457 | **-0.782** |
| CT | TGCACG | 535.88 | 829 | 1.547 | **0.436** |
| CT | TGCACC | 1631.31 | 2321 | 1.423 | **0.353** |
| CT | TGCACA | 1320.60 | 1508 | 1.142 | **0.133** |
| CT | TGCACT | 1167.85 | 1185 | 1.015 | **0.015** |
| CT | TGTACT | 983.66 | 802 | 0.815 | **-0.204** |
| CT | TGTACA | 1112.32 | 830 | 0.746 | **-0.293** |
| CT | TGTACC | 1374.02 | 942 | 0.686 | **-0.377** |
| CT | TGTACG | 451.36 | 160 | 0.354 | **-1.037** |
| CV | TGTGTC | 1064.94 | 1821 | 1.710 | **0.536** |
| CV | TGTGTT | 831.78 | 1383 | 1.663 | **0.508** |
| CV | TGTGTA | 540.10 | 866 | 1.603 | **0.472** |
| CV | TGTGTG | 2106.78 | 3241 | 1.538 | **0.431** |
| CV | TGCGTG | 2501.27 | 1537 | 0.614 | **-0.487** |
| CV | TGCGTC | 1264.35 | 734 | 0.581 | **-0.544** |
| CV | TGCGTT | 987.53 | 219 | 0.222 | **-1.506** |
| CV | TGCGTA | 641.24 | 137 | 0.214 | **-1.543** |
| CW | TGCTGG | 1275.05 | 1842 | 1.445 | **0.368** |
| CW | TGTTGG | 1073.95 | 507 | 0.472 | **-0.751** |
| CY | TGCTAC | 1379.34 | 1995 | 1.446 | **0.369** |
| CY | TGCTAT | 1120.82 | 1170 | 1.044 | **0.043** |
| CY | TGTTAT | 944.05 | 653 | 0.692 | **-0.369** |
| CY | TGTTAC | 1161.80 | 788 | 0.678 | **-0.388** |
| DA | GATGCT | 2675.13 | 5292 | 1.978 | **0.682** |
| DA | GATGCA | 2341.80 | 3898 | 1.665 | **0.510** |
| DA | GATGCC | 4067.71 | 5983 | 1.471 | **0.386** |
| DA | GACGCG | 1242.39 | 1116 | 0.898 | **-0.107** |

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| DA | GATGCG | 1099.83 | 972 | 0.884 | **-0.124** |
| DA | GACGCC | 4594.94 | 2668 | 0.581 | **-0.544** |
| DA | GACGCA | 2645.34 | 852 | 0.322 | **-1.133** |
| DA | GACGCT | 3021.87 | 908 | 0.300 | **-1.202** |
| DC | GACTGC | 2386.86 | 3465 | 1.452 | **0.373** |
| DC | GACTGT | 2010.41 | 2804 | 1.395 | **0.333** |
| DC | GATTGT | 1779.74 | 1163 | 0.653 | **-0.425** |
| DC | GATTGC | 2112.99 | 858 | 0.406 | **-0.901** |
| DD | GATGAT | 4271.42 | 7846 | 1.837 | **0.608** |
| DD | GATGAC | 4825.06 | 7181 | 1.488 | **0.398** |
| DD | GACGAC | 5450.46 | 2965 | 0.544 | **-0.609** |
| DD | GACGAT | 4825.06 | 1380 | 0.286 | **-1.252** |
| DE | GATGAA | 5114.33 | 10045 | 1.964 | **0.675** |
| DE | GATGAG | 6839.48 | 9573 | 1.400 | **0.336** |
| DE | GACGAG | 7725.97 | 4498 | 0.582 | **-0.541** |
| DE | GACGAA | 5777.22 | 1341 | 0.232 | **-1.461** |
| DF | GACTTC | 4696.28 | 6094 | 1.298 | **0.261** |
| DF | GACTTT | 4103.05 | 4250 | 1.036 | **0.035** |
| DF | GATTTT | 3632.26 | 3485 | 0.959 | **-0.041** |
| DF | GATTTC | 4157.42 | 2760 | 0.664 | **-0.410** |
| DG | GATGGT | 1910.36 | 3443 | 1.802 | **0.589** |
| DG | GATGGA | 2950.72 | 5133 | 1.740 | **0.554** |
| DG | GATGGG | 2880.65 | 4437 | 1.540 | **0.432** |
| DG | GATGGC | 4000.77 | 5419 | 1.354 | **0.303** |
| DG | GACGGC | 4519.33 | 2987 | 0.661 | **-0.414** |
| DG | GACGGG | 3254.02 | 1979 | 0.608 | **-0.497** |
| DG | GACGGT | 2157.97 | 723 | 0.335 | **-1.094** |
| DG | GACGGA | 3333.18 | 886 | 0.266 | **-1.325** |
| DH | GACCAC | 2653.74 | 3480 | 1.311 | **0.271** |
| DH | GACCAT | 1924.41 | 2014 | 1.047 | **0.046** |
| DH | GATCAT | 1703.60 | 1623 | 0.953 | **-0.048** |
| DH | GATCAC | 2349.25 | 1514 | 0.644 | **-0.439** |
| DI | GACATC | 4715.94 | 6532 | 1.385 | **0.326** |
| DI | GACATT | 3729.31 | 4087 | 1.096 | **0.092** |
| DI | GATATT | 3301.40 | 3271 | 0.991 | **-0.009** |
| DI | GATATA | 1518.36 | 1495 | 0.985 | **-0.016** |
| DI | GACATA | 1715.16 | 1565 | 0.912 | **-0.092** |
| DI | GATATC | 4174.83 | 2205 | 0.528 | **-0.638** |
| DK | GACAAG | 5562.52 | 7324 | 1.317 | **0.275** |
| DK | GACAAA | 4295.02 | 4794 | 1.116 | **0.110** |
| DK | GATAAA | 3802.20 | 3855 | 1.014 | **0.014** |
| DK | GATAAG | 4924.27 | 2611 | 0.530 | **-0.634** |
| DL | GACCTC | 3785.97 | 5029 | 1.328 | **0.284** |
| DL | GACTTG | 2557.95 | 3396 | 1.328 | **0.283** |
| DL | GATTTA | 1347.95 | 1740 | 1.291 | **0.255** |
| DL | GACCTG | 7867.71 | 9796 | 1.245 | **0.219** |
| DL | GATTTG | 2264.44 | 2687 | 1.187 | **0.171** |
| DL | GACCTT | 2610.58 | 2774 | 1.063 | **0.061** |
| DL | GATCTT | 2311.04 | 2416 | 1.045 | **0.044** |
| DL | GACCTA | 1407.87 | 1416 | 1.006 | **0.006** |
| DL | GACTTA | 1522.66 | 1403 | 0.921 | **-0.082** |
| DL | GATCTA | 1246.33 | 1020 | 0.818 | **-0.200** |
| DL | GATCTC | 3351.56 | 2214 | 0.661 | **-0.415** |

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| DL | GATCTG | 6964.95 | 3348 | 0.481 | **-0.733** |
| DM | GACATG | 4089.63 | 5411 | 1.323 | **0.280** |
| DM | GATATG | 3620.37 | 2299 | 0.635 | **-0.454** |
| DN | GACAAC | 3511.00 | 4849 | 1.381 | **0.323** |
| DN | GACAAT | 3187.82 | 3349 | 1.051 | **0.049** |
| DN | GATAAT | 2822.05 | 2549 | 0.903 | **-0.102** |
| DN | GATAAC | 3108.14 | 1882 | 0.606 | **-0.502** |
| DP | GACCCC | 3732.11 | 5119 | 1.372 | **0.316** |
| DP | GACCCG | 1352.28 | 1692 | 1.251 | **0.224** |
| DP | GACCCT | 3342.62 | 3700 | 1.107 | **0.102** |
| DP | GATCCT | 2959.08 | 3111 | 1.051 | **0.050** |
| DP | GACCCA | 3226.05 | 3205 | 0.993 | **-0.007** |
| DP | GATCCA | 2855.89 | 2349 | 0.823 | **-0.195** |
| DP | GATCCC | 3303.88 | 2338 | 0.708 | **-0.346** |
| DP | GATCCG | 1197.11 | 455 | 0.380 | **-0.967** |
| DQ | GACCAG | 5250.37 | 6524 | 1.243 | **0.217** |
| DQ | GACCAA | 1880.22 | 2169 | 1.154 | **0.143** |
| DQ | GATCAA | 1664.48 | 1808 | 1.086 | **0.083** |
| DQ | GATCAG | 4647.93 | 2942 | 0.633 | **-0.457** |
| DR | GACCGC | 1807.77 | 2634 | 1.457 | **0.376** |
| DR | GACAGA | 1994.00 | 2869 | 1.439 | **0.364** |
| DR | GACAGG | 1957.57 | 2730 | 1.395 | **0.333** |
| DR | GACCGT | 773.97 | 1029 | 1.330 | **0.285** |
| DR | GACCGG | 1977.16 | 2568 | 1.299 | **0.261** |
| DR | GACCGA | 1071.78 | 1292 | 1.205 | **0.187** |
| DR | GATCGA | 948.80 | 923 | 0.973 | **-0.028** |
| DR | GATCGT | 685.16 | 626 | 0.914 | **-0.090** |
| DR | GATAGA | 1765.20 | 1123 | 0.636 | **-0.452** |
| DR | GATCGG | 1750.30 | 859 | 0.491 | **-0.712** |
| DR | GATCGC | 1600.34 | 754 | 0.471 | **-0.753** |
| DR | GATAGG | 1732.96 | 658 | 0.380 | **-0.968** |
| DS | GACTCG | 918.57 | 1527 | 1.662 | **0.508** |
| DS | GACAGC | 3935.48 | 6143 | 1.561 | **0.445** |
| DS | GACAGT | 2482.92 | 3657 | 1.473 | **0.387** |
| DS | GATTCT | 2675.01 | 2968 | 1.110 | **0.104** |
| DS | GACTCC | 3473.65 | 3800 | 1.094 | **0.090** |
| DS | GATTCA | 2162.59 | 2129 | 0.984 | **-0.016** |
| DS | GACTCA | 2442.89 | 2382 | 0.975 | **-0.025** |
| DS | GACTCT | 3021.73 | 2910 | 0.963 | **-0.038** |
| DS | GATTCC | 3075.07 | 2186 | 0.711 | **-0.341** |
| DS | GATAGT | 2198.02 | 1355 | 0.616 | **-0.484** |
| DS | GATTCG | 813.17 | 414 | 0.509 | **-0.675** |
| DS | GATAGC | 3483.91 | 1212 | 0.348 | **-1.056** |
| DT | GACACG | 1110.58 | 1842 | 1.659 | **0.506** |
| DT | GACACC | 3380.79 | 4666 | 1.380 | **0.322** |
| DT | GACACA | 2736.88 | 3538 | 1.293 | **0.257** |
| DT | GACACT | 2420.30 | 2688 | 1.111 | **0.105** |
| DT | GATACT | 2142.59 | 1731 | 0.808 | **-0.213** |
| DT | GATACA | 2422.85 | 1788 | 0.738 | **-0.304** |
| DT | GATACC | 2992.87 | 1586 | 0.530 | **-0.635** |
| DT | GATACG | 983.15 | 351 | 0.357 | **-1.030** |
| DV | GATGTT | 1957.96 | 3699 | 1.889 | **0.636** |
| DV | GATGTA | 1271.37 | 2214 | 1.741 | **0.555** |

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| --- | --- | --- | --- | --- | --- |
| DV | GATGTC | 2506.81 | 3869 | 1.543 | **0.434** |
| DV | GATGTG | 4959.23 | 6668 | 1.345 | **0.296** |
| DV | GACGTG | 5602.02 | 3616 | 0.645 | **-0.438** |
| DV | GACGTC | 2831.73 | 1654 | 0.584 | **-0.538** |
| DV | GACGTT | 2211.73 | 672 | 0.304 | **-1.191** |
| DV | GACGTA | 1436.16 | 385 | 0.268 | **-1.316** |
| DW | GACTGG | 2619.27 | 3853 | 1.471 | **0.386** |
| DW | GATTGG | 2318.73 | 1085 | 0.468 | **-0.759** |
| DY | GACTAC | 3307.71 | 3930 | 1.188 | **0.172** |
| DY | GATTAT | 2379.36 | 2608 | 1.096 | **0.092** |
| DY | GACTAT | 2687.76 | 2853 | 1.061 | **0.060** |
| DY | GATTAC | 2928.18 | 1912 | 0.653 | **-0.426** |
| EA | GAGGCG | 2437.29 | 3179 | 1.304 | **0.266** |
| EA | GAAGCA | 3880.59 | 4844 | 1.248 | **0.222** |
| EA | GAAGCT | 4432.94 | 5143 | 1.160 | **0.149** |
| EA | GAGGCC | 9014.27 | 9805 | 1.088 | **0.084** |
| EA | GAGGCT | 5928.25 | 5314 | 0.896 | **-0.109** |
| EA | GAGGCA | 5189.57 | 4530 | 0.873 | **-0.136** |
| EA | GAAGCC | 6740.57 | 5649 | 0.838 | **-0.177** |
| EA | GAAGCG | 1822.52 | 982 | 0.539 | **-0.618** |
| EC | GAATGT | 2182.58 | 3541 | 1.622 | **0.484** |
| EC | GAGTGT | 2918.80 | 2792 | 0.957 | **-0.044** |
| EC | GAGTGC | 3465.35 | 2987 | 0.862 | **-0.149** |
| EC | GAATGC | 2591.27 | 1838 | 0.709 | **-0.343** |
| ED | GAAGAT | 6605.82 | 9691 | 1.467 | **0.383** |
| ED | GAGGAC | 9979.09 | 9684 | 0.970 | **-0.030** |
| ED | GAAGAC | 7462.02 | 6820 | 0.914 | **-0.090** |
| ED | GAGGAT | 8834.07 | 6686 | 0.757 | **-0.279** |
| EE | GAAGAA | 10747.11 | 14461 | 1.346 | **0.297** |
| EE | GAGGAG | 19220.31 | 21731 | 1.131 | **0.123** |
| EE | GAAGAG | 14372.29 | 11875 | 0.826 | **-0.191** |
| EE | GAGGAA | 14372.29 | 10645 | 0.741 | **-0.300** |
| EF | GAATTT | 3136.91 | 4237 | 1.351 | **0.301** |
| EF | GAGTTC | 4801.58 | 4739 | 0.987 | **-0.013** |
| EF | GAGTTT | 4195.05 | 4095 | 0.976 | **-0.024** |
| EF | GAATTC | 3590.46 | 2653 | 0.739 | **-0.303** |
| EG | GAAGGA | 3358.73 | 5032 | 1.498 | **0.404** |
| EG | GAAGGT | 2174.51 | 2839 | 1.306 | **0.267** |
| EG | GAAGGG | 3278.97 | 3559 | 1.085 | **0.082** |
| EG | GAGGGC | 6090.10 | 6505 | 1.068 | **0.066** |
| EG | GAAGGC | 4553.97 | 4340 | 0.953 | **-0.048** |
| EG | GAGGGG | 4385.02 | 3795 | 0.865 | **-0.145** |
| EG | GAGGGT | 2908.01 | 2378 | 0.818 | **-0.201** |
| EG | GAGGGA | 4491.69 | 2793 | 0.622 | **-0.475** |
| EH | GAACAT | 2017.28 | 2539 | 1.259 | **0.230** |
| EH | GAGCAC | 3720.16 | 4190 | 1.126 | **0.119** |
| EH | GAGCAT | 2697.74 | 2448 | 0.907 | **-0.097** |
| EH | GAACAC | 2781.81 | 2040 | 0.733 | **-0.310** |
| EI | GAAATA | 1687.78 | 3007 | 1.782 | **0.578** |
| EI | GAAATT | 3669.78 | 4788 | 1.305 | **0.266** |
| EI | GAGATC | 6206.03 | 6191 | 0.998 | **-0.002** |
| EI | GAGATT | 4907.66 | 3978 | 0.811 | **-0.210** |
| EI | GAGATA | 2257.09 | 1785 | 0.791 | **-0.235** |

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| EI | GAAATC | 4640.66 | 3620 | 0.780 | **-0.248** |
| EK | GAGAAG | 12729.57 | 15133 | 1.189 | **0.173** |
| EK | GAAAAA | 7349.75 | 7522 | 1.023 | **0.023** |
| EK | GAGAAA | 9828.94 | 9127 | 0.929 | **-0.074** |
| EK | GAAAAG | 9518.74 | 7645 | 0.803 | **-0.219** |
| EL | GAGCTG | 10945.64 | 15625 | 1.428 | **0.356** |
| EL | GAATTA | 1584.03 | 2256 | 1.424 | **0.354** |
| EL | GAACTA | 1464.61 | 1830 | 1.249 | **0.223** |
| EL | GAACTT | 2715.79 | 3371 | 1.241 | **0.216** |
| EL | GAGCTC | 5267.08 | 5877 | 1.116 | **0.110** |
| EL | GAGCTA | 1958.64 | 2049 | 1.046 | **0.045** |
| EL | GAATTG | 2661.03 | 2335 | 0.877 | **-0.131** |
| EL | GAGCTT | 3631.87 | 3084 | 0.849 | **-0.164** |
| EL | GAGTTG | 3558.64 | 2719 | 0.764 | **-0.269** |
| EL | GAACTC | 3938.54 | 2632 | 0.668 | **-0.403** |
| EL | GAGTTA | 2118.35 | 1357 | 0.641 | **-0.445** |
| EL | GAACTG | 8184.78 | 4894 | 0.598 | **-0.514** |
| EM | GAAATG | 4983.92 | 5010 | 1.005 | **0.005** |
| EM | GAGATG | 6665.08 | 6639 | 0.996 | **-0.004** |
| EN | GAAAAT | 4791.73 | 6977 | 1.456 | **0.376** |
| EN | GAGAAC | 7057.70 | 6756 | 0.957 | **-0.044** |
| EN | GAAAAC | 5277.51 | 4930 | 0.934 | **-0.068** |
| EN | GAGAAT | 6408.07 | 4872 | 0.760 | **-0.274** |
| EP | GAGCCG | 1650.94 | 2438 | 1.477 | **0.390** |
| EP | GAGCCC | 4556.38 | 6270 | 1.376 | **0.319** |
| EP | GAGCCT | 4080.86 | 4236 | 1.038 | **0.037** |
| EP | GAGCCA | 3938.55 | 4067 | 1.033 | **0.032** |
| EP | GAACCA | 2945.12 | 2684 | 0.911 | **-0.093** |
| EP | GAACCT | 3051.53 | 2547 | 0.835 | **-0.181** |
| EP | GAACCC | 3407.10 | 2106 | 0.618 | **-0.481** |
| EP | GAACCG | 1234.52 | 517 | 0.419 | **-0.870** |
| EQ | GAACAA | 2579.50 | 3396 | 1.317 | **0.275** |
| EQ | GAGCAG | 9632.80 | 11185 | 1.161 | **0.149** |
| EQ | GAGCAA | 3449.61 | 3185 | 0.923 | **-0.080** |
| EQ | GAACAG | 7203.08 | 5099 | 0.708 | **-0.345** |
| ER | GAAAGA | 2650.27 | 3769 | 1.422 | **0.352** |
| ER | GAGAGG | 3479.50 | 4315 | 1.240 | **0.215** |
| ER | GAGCGG | 3514.32 | 4356 | 1.240 | **0.215** |
| ER | GAGCGC | 3213.23 | 3682 | 1.146 | **0.136** |
| ER | GAAAGG | 2601.85 | 2679 | 1.030 | **0.029** |
| ER | GAGAGA | 3544.25 | 3633 | 1.025 | **0.025** |
| ER | GAGCGT | 1375.70 | 1286 | 0.935 | **-0.067** |
| ER | GAACGT | 1028.70 | 894 | 0.869 | **-0.140** |
| ER | GAACGA | 1424.52 | 1188 | 0.834 | **-0.182** |
| ER | GAGCGA | 1905.04 | 1562 | 0.820 | **-0.199** |
| ER | GAACGG | 2627.88 | 1333 | 0.507 | **-0.679** |
| ER | GAACGC | 2402.74 | 1071 | 0.446 | **-0.808** |
| ES | GAAAGT | 2081.93 | 3138 | 1.507 | **0.410** |
| ES | GAGAGC | 4413.03 | 5786 | 1.311 | **0.271** |
| ES | GAGAGT | 2784.21 | 3237 | 1.163 | **0.151** |
| ES | GAGTCG | 1030.03 | 1174 | 1.140 | **0.131** |
| ES | GAATCT | 2533.73 | 2812 | 1.110 | **0.104** |
| ES | GAATCA | 2048.37 | 2131 | 1.040 | **0.040** |

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| ES | GAAAGC | 3299.91 | 2880 | 0.873 | **-0.136** |
| ES | GAGTCC | 3895.16 | 3392 | 0.871 | **-0.138** |
| ES | GAGTCT | 3388.40 | 2799 | 0.826 | **-0.191** |
| ES | GAGTCA | 2739.33 | 2198 | 0.802 | **-0.220** |
| ES | GAATCC | 2912.67 | 1943 | 0.667 | **-0.405** |
| ES | GAATCG | 770.22 | 407 | 0.528 | **-0.638** |
| ET | GAGACG | 1658.42 | 2190 | 1.321 | **0.278** |
| ET | GAAACA | 3056.09 | 3851 | 1.260 | **0.231** |
| ET | GAAACT | 2702.59 | 3224 | 1.193 | **0.176** |
| ET | GAGACC | 5048.51 | 5514 | 1.092 | **0.088** |
| ET | GAGACA | 4086.97 | 3619 | 0.885 | **-0.122** |
| ET | GAGACT | 3614.21 | 3028 | 0.838 | **-0.177** |
| ET | GAAACC | 3775.11 | 2950 | 0.781 | **-0.247** |
| ET | GAAACG | 1240.11 | 806 | 0.650 | **-0.431** |
| EV | GAAGTA | 1580.16 | 2675 | 1.693 | **0.526** |
| EV | GAAGTT | 2433.50 | 3724 | 1.530 | **0.425** |
| EV | GAGGTG | 8242.83 | 9074 | 1.101 | **0.096** |
| EV | GAAGTC | 3115.66 | 2860 | 0.918 | **-0.086** |
| EV | GAGGTC | 4166.62 | 3741 | 0.898 | **-0.108** |
| EV | GAAGTG | 6163.71 | 5122 | 0.831 | **-0.185** |
| EV | GAGGTT | 3254.36 | 2359 | 0.725 | **-0.322** |
| EV | GAGGTA | 2113.17 | 1515 | 0.717 | **-0.333** |
| EW | GAGTGG | 3085.08 | 3238 | 1.050 | **0.048** |
| EW | GAATGG | 2306.92 | 2154 | 0.934 | **-0.069** |
| EY | GAATAT | 2307.55 | 3428 | 1.486 | **0.396** |
| EY | GAGTAC | 3797.72 | 3796 | 1.000 | **0.000** |
| EY | GAGTAT | 3085.93 | 2596 | 0.841 | **-0.173** |
| EY | GAATAC | 2839.80 | 2211 | 0.779 | **-0.250** |
| FA | TTTGCA | 1643.98 | 3299 | 2.007 | **0.696** |
| FA | TTTGCT | 1877.98 | 3746 | 1.995 | **0.690** |
| FA | TTTGCC | 2855.59 | 4348 | 1.523 | **0.420** |
| FA | TTTGCG | 772.10 | 622 | 0.806 | **-0.216** |
| FA | TTCGCG | 883.73 | 598 | 0.677 | **-0.391** |
| FA | TTCGCC | 3268.46 | 1802 | 0.551 | **-0.595** |
| FA | TTCGCT | 2149.50 | 516 | 0.240 | **-1.427** |
| FA | TTCGCA | 1881.67 | 402 | 0.214 | **-1.543** |
| FC | TTCTGC | 2058.60 | 3045 | 1.479 | **0.391** |
| FC | TTCTGT | 1733.93 | 2055 | 1.185 | **0.170** |
| FC | TTTTGT | 1514.90 | 1159 | 0.765 | **-0.268** |
| FC | TTTTGC | 1798.56 | 847 | 0.471 | **-0.753** |
| FD | TTTGAT | 2786.65 | 5380 | 1.931 | **0.658** |
| FD | TTTGAC | 3147.84 | 4737 | 1.505 | **0.409** |
| FD | TTCGAC | 3602.96 | 1746 | 0.485 | **-0.724** |
| FD | TTCGAT | 3189.55 | 864 | 0.271 | **-1.306** |
| FE | TTTGAA | 3016.02 | 6247 | 2.071 | **0.728** |
| FE | TTTGAG | 4033.37 | 6066 | 1.504 | **0.408** |
| FE | TTCGAG | 4616.53 | 2165 | 0.469 | **-0.757** |
| FE | TTCGAA | 3452.08 | 640 | 0.185 | **-1.685** |
| FF | TTCTTC | 3429.53 | 5168 | 1.507 | **0.410** |
| FF | TTCTTT | 2996.32 | 2989 | 0.998 | **-0.002** |
| FF | TTTTTT | 2617.83 | 1937 | 0.740 | **-0.301** |
| FF | TTTTTC | 2996.32 | 1946 | 0.649 | **-0.432** |
| FG | TTTGGA | 2068.21 | 4271 | 2.065 | **0.725** |

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| FG | TTTGGT | 1339.00 | 2552 | 1.906 | **0.645** |
| FG | TTTGGG | 2019.09 | 3449 | 1.708 | **0.535** |
| FG | TTTGGC | 2804.20 | 3462 | 1.235 | **0.211** |
| FG | TTCGGG | 2311.02 | 1292 | 0.559 | **-0.581** |
| FG | TTCGGC | 3209.64 | 1648 | 0.513 | **-0.667** |
| FG | TTCGGT | 1532.60 | 419 | 0.273 | **-1.297** |
| FG | TTCGGA | 2367.24 | 558 | 0.236 | **-1.445** |
| FH | TTCCAC | 2463.48 | 3200 | 1.299 | **0.262** |
| FH | TTTCAT | 1560.78 | 1697 | 1.087 | **0.084** |
| FH | TTCCAT | 1786.44 | 1866 | 1.045 | **0.044** |
| FH | TTTCAC | 2152.30 | 1200 | 0.558 | **-0.584** |
| FI | TTCATC | 3454.46 | 5156 | 1.493 | **0.400** |
| FI | TTCATT | 2731.75 | 2953 | 1.081 | **0.078** |
| FI | TTTATT | 2386.67 | 2296 | 0.962 | **-0.039** |
| FI | TTTATA | 1097.66 | 950 | 0.865 | **-0.144** |
| FI | TTCATA | 1256.36 | 1035 | 0.824 | **-0.194** |
| FI | TTTATC | 3018.10 | 1555 | 0.515 | **-0.663** |
| FK | TTCAAG | 4090.45 | 5137 | 1.256 | **0.228** |
| FK | TTCAAA | 3158.38 | 3245 | 1.027 | **0.027** |
| FK | TTTAAA | 2759.42 | 2762 | 1.001 | **0.001** |
| FK | TTTAAG | 3573.75 | 2438 | 0.682 | **-0.382** |
| FL | TTCCTC | 3228.53 | 4426 | 1.371 | **0.315** |
| FL | TTCCTG | 6709.28 | 8734 | 1.302 | **0.264** |
| FL | TTTTTA | 1134.45 | 1334 | 1.176 | **0.162** |
| FL | TTTCTT | 1945.00 | 2267 | 1.166 | **0.153** |
| FL | TTCCTA | 1200.58 | 1280 | 1.066 | **0.064** |
| FL | TTTCTA | 1048.92 | 1087 | 1.036 | **0.036** |
| FL | TTCTTG | 2181.32 | 2239 | 1.026 | **0.026** |
| FL | TTCCTT | 2226.21 | 2150 | 0.966 | **-0.035** |
| FL | TTTTTG | 1905.78 | 1799 | 0.944 | **-0.058** |
| FL | TTCTTA | 1298.47 | 1144 | 0.881 | **-0.127** |
| FL | TTTCTC | 2820.70 | 1904 | 0.675 | **-0.393** |
| FL | TTTCTG | 5861.77 | 3197 | 0.545 | **-0.606** |
| FM | TTCATG | 2804.11 | 3662 | 1.306 | **0.267** |
| FM | TTTATG | 2449.89 | 1592 | 0.650 | **-0.431** |
| FN | TTCAAC | 2855.47 | 3919 | 1.372 | **0.317** |
| FN | TTTAAT | 2265.13 | 2185 | 0.965 | **-0.036** |
| FN | TTCAAT | 2592.63 | 2456 | 0.947 | **-0.054** |
| FN | TTTAAC | 2494.77 | 1648 | 0.661 | **-0.415** |
| FP | TTCCCG | 961.40 | 1205 | 1.253 | **0.226** |
| FP | TTTCCT | 2076.25 | 2539 | 1.223 | **0.201** |
| FP | TTCCCC | 2653.35 | 3099 | 1.168 | **0.155** |
| FP | TTTCCA | 2003.85 | 2141 | 1.068 | **0.066** |
| FP | TTCCCA | 2293.57 | 2310 | 1.007 | **0.007** |
| FP | TTCCCT | 2376.44 | 2379 | 1.001 | **0.001** |
| FP | TTTCCC | 2318.18 | 1529 | 0.660 | **-0.416** |
| FP | TTTCCG | 839.96 | 321 | 0.382 | **-0.962** |
| FQ | TTCCAG | 5468.69 | 7069 | 1.293 | **0.257** |
| FQ | TTTCAA | 1711.02 | 1803 | 1.054 | **0.052** |
| FQ | TTCCAA | 1958.40 | 1980 | 1.011 | **0.011** |
| FQ | TTTCAG | 4777.89 | 3064 | 0.641 | **-0.444** |
| FR | TTCCGC | 1531.47 | 2588 | 1.690 | **0.525** |
| FR | TTCCGA | 907.97 | 1410 | 1.553 | **0.440** |

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| FR | TTCCGG | 1674.97 | 2451 | 1.463 | **0.381** |
| FR | TTCCGT | 655.68 | 893 | 1.362 | **0.309** |
| FR | TTCAGA | 1689.24 | 1852 | 1.096 | **0.092** |
| FR | TTCAGG | 1658.38 | 1810 | 1.091 | **0.087** |
| FR | TTTCGA | 793.28 | 850 | 1.072 | **0.069** |
| FR | TTTCGT | 572.85 | 490 | 0.855 | **-0.156** |
| FR | TTTAGA | 1475.86 | 947 | 0.642 | **-0.444** |
| FR | TTTAGG | 1448.90 | 691 | 0.477 | **-0.740** |
| FR | TTTCGG | 1463.39 | 688 | 0.470 | **-0.755** |
| FR | TTTCGC | 1338.02 | 540 | 0.404 | **-0.907** |
| FS | TTCTCC | 2990.83 | 4507 | 1.507 | **0.410** |
| FS | TTCAGC | 3388.47 | 4577 | 1.351 | **0.301** |
| FS | TTCAGT | 2137.80 | 2692 | 1.259 | **0.231** |
| FS | TTCTCG | 790.89 | 910 | 1.151 | **0.140** |
| FS | TTTTCT | 2273.08 | 2536 | 1.116 | **0.109** |
| FS | TTCTCT | 2601.73 | 2741 | 1.054 | **0.052** |
| FS | TTTTCA | 1837.65 | 1903 | 1.036 | **0.035** |
| FS | TTCTCA | 2103.34 | 1997 | 0.949 | **-0.052** |
| FS | TTTTCC | 2613.03 | 1872 | 0.716 | **-0.334** |
| FS | TTTAGT | 1867.76 | 1201 | 0.643 | **-0.442** |
| FS | TTTTCG | 690.99 | 258 | 0.373 | **-0.985** |
| FS | TTTAGC | 2960.44 | 1062 | 0.359 | **-1.025** |
| FT | TTCACC | 2909.29 | 4513 | 1.551 | **0.439** |
| FT | TTCACG | 955.69 | 1315 | 1.376 | **0.319** |
| FT | TTCACT | 2082.75 | 2494 | 1.197 | **0.180** |
| FT | TTCACA | 2355.18 | 2372 | 1.007 | **0.007** |
| FT | TTTACT | 1819.66 | 1622 | 0.891 | **-0.115** |
| FT | TTTACA | 2057.68 | 1485 | 0.722 | **-0.326** |
| FT | TTTACC | 2541.79 | 1495 | 0.588 | **-0.531** |
| FT | TTTACG | 834.97 | 261 | 0.313 | **-1.163** |
| FV | TTTGTA | 912.19 | 1711 | 1.876 | **0.629** |
| FV | TTTGTT | 1404.80 | 2620 | 1.865 | **0.623** |
| FV | TTTGTC | 1798.60 | 2635 | 1.465 | **0.382** |
| FV | TTTGTG | 3558.17 | 5206 | 1.463 | **0.381** |
| FV | TTCGTG | 4072.62 | 2589 | 0.636 | **-0.453** |
| FV | TTCGTC | 2058.64 | 1086 | 0.528 | **-0.640** |
| FV | TTCGTT | 1607.91 | 386 | 0.240 | **-1.427** |
| FV | TTCGTA | 1044.07 | 224 | 0.215 | **-1.539** |
| FW | TTCTGG | 2126.30 | 2834 | 1.333 | **0.287** |
| FW | TTTTGG | 1857.70 | 1150 | 0.619 | **-0.480** |
| FY | TTCTAC | 2720.70 | 3710 | 1.364 | **0.310** |
| FY | TTTTAT | 1931.51 | 2003 | 1.037 | **0.036** |
| FY | TTCTAT | 2210.77 | 2145 | 0.970 | **-0.030** |
| FY | TTTTAC | 2377.02 | 1382 | 0.581 | **-0.542** |
| GA | GGTGCT | 1531.20 | 2505 | 1.636 | **0.492** |
| GA | GGGGCG | 949.27 | 1433 | 1.510 | **0.412** |
| GA | GGGGCC | 3510.85 | 5061 | 1.442 | **0.366** |
| GA | GGTGCC | 2328.29 | 3109 | 1.335 | **0.289** |
| GA | GGAGCA | 2070.38 | 2678 | 1.293 | **0.257** |
| GA | GGTGCA | 1340.41 | 1715 | 1.279 | **0.246** |
| GA | GGCGCG | 1318.38 | 1659 | 1.258 | **0.230** |
| GA | GGAGCT | 2365.08 | 2975 | 1.258 | **0.229** |
| GA | GGGGCT | 2308.91 | 2850 | 1.234 | **0.211** |

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| --- | --- | --- | --- | --- | --- |
| GA | GGAGCC | 3596.25 | 3845 | 1.069 | **0.067** |
| GA | GGGGCA | 2021.22 | 2074 | 1.026 | **0.026** |
| GA | GGTGCG | 629.52 | 501 | 0.796 | **-0.228** |
| GA | GGAGCG | 972.36 | 712 | 0.732 | **-0.312** |
| GA | GGCGCC | 4876.02 | 3121 | 0.640 | **-0.446** |
| GA | GGCGCT | 3206.72 | 906 | 0.283 | **-1.264** |
| GA | GGCGCA | 2807.15 | 688 | 0.245 | **-1.406** |
| GC | GGCTGC | 1888.96 | 4102 | 2.172 | **0.775** |
| GC | GGCTGT | 1591.04 | 2360 | 1.483 | **0.394** |
| GC | GGTTGT | 759.72 | 658 | 0.866 | **-0.144** |
| GC | GGATGT | 1173.45 | 793 | 0.676 | **-0.392** |
| GC | GGTTGC | 901.97 | 523 | 0.580 | **-0.545** |
| GC | GGATGC | 1393.18 | 655 | 0.470 | **-0.755** |
| GC | GGGTGC | 1360.09 | 628 | 0.462 | **-0.773** |
| GC | GGGTGT | 1145.59 | 495 | 0.432 | **-0.839** |
| GD | GGGGAC | 3126.50 | 4967 | 1.589 | **0.463** |
| GD | GGTGAT | 1835.49 | 2621 | 1.428 | **0.356** |
| GD | GGTGAC | 2073.40 | 2960 | 1.428 | **0.356** |
| GD | GGAGAT | 2835.09 | 3829 | 1.351 | **0.301** |
| GD | GGAGAC | 3202.56 | 4240 | 1.324 | **0.281** |
| GD | GGGGAT | 2767.76 | 2575 | 0.930 | **-0.072** |
| GD | GGCGAC | 4342.22 | 1955 | 0.450 | **-0.798** |
| GD | GGCGAT | 3843.98 | 880 | 0.229 | **-1.474** |
| GE | GGAGAA | 3433.99 | 5903 | 1.719 | **0.542** |
| GE | GGGGAG | 4483.27 | 6552 | 1.461 | **0.379** |
| GE | GGTGAA | 2223.23 | 3248 | 1.461 | **0.379** |
| GE | GGAGAG | 4592.33 | 5961 | 1.298 | **0.261** |
| GE | GGTGAG | 2973.17 | 2988 | 1.005 | **0.005** |
| GE | GGGGAA | 3352.44 | 3041 | 0.907 | **-0.098** |
| GE | GGCGAG | 6226.56 | 3530 | 0.567 | **-0.568** |
| GE | GGCGAA | 4656.01 | 718 | 0.154 | **-1.869** |
| GF | GGCTTC | 3466.22 | 6121 | 1.766 | **0.569** |
| GF | GGATTT | 2233.54 | 2666 | 1.194 | **0.177** |
| GF | GGTTTT | 1446.04 | 1665 | 1.151 | **0.141** |
| GF | GGCTTT | 3028.37 | 3201 | 1.057 | **0.055** |
| GF | GGTTTC | 1655.11 | 1548 | 0.935 | **-0.067** |
| GF | GGATTC | 2556.47 | 1534 | 0.600 | **-0.511** |
| GF | GGGTTT | 2180.50 | 1244 | 0.571 | **-0.561** |
| GF | GGGTTC | 2495.76 | 1083 | 0.434 | **-0.835** |
| GG | GGTGGT | 1061.28 | 2286 | 2.154 | **0.767** |
| GG | GGTGGC | 2222.59 | 3657 | 1.645 | **0.498** |
| GG | GGTGGA | 1639.25 | 2618 | 1.597 | **0.468** |
| GG | GGAGGA | 2531.97 | 3609 | 1.425 | **0.354** |
| GG | GGTGGG | 1600.32 | 2267 | 1.417 | **0.348** |
| GG | GGGGGC | 3351.47 | 4673 | 1.394 | **0.332** |
| GG | GGAGGT | 1639.25 | 2152 | 1.313 | **0.272** |
| GG | GGAGGC | 3433.00 | 3776 | 1.100 | **0.095** |
| GG | GGCGGC | 4654.67 | 4787 | 1.028 | **0.028** |
| GG | GGGGGT | 1600.32 | 1543 | 0.964 | **-0.036** |
| GG | GGAGGG | 2471.84 | 2351 | 0.951 | **-0.050** |
| GG | GGGGGA | 2471.84 | 1517 | 0.614 | **-0.488** |
| GG | GGCGGG | 3351.47 | 2001 | 0.597 | **-0.516** |
| GG | GGGGGG | 2413.14 | 1080 | 0.448 | **-0.804** |

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| --- | --- | --- | --- | --- | --- |
| GG | GGCGGT | 2222.59 | 936 | 0.421 | **-0.865** |
| GG | GGCGGA | 3433.00 | 845 | 0.246 | **-1.402** |
| GH | GGCCAC | 2540.15 | 3679 | 1.448 | **0.370** |
| GH | GGTCAT | 879.57 | 1022 | 1.162 | **0.150** |
| GH | GGACAT | 1358.57 | 1438 | 1.058 | **0.057** |
| GH | GGCCAT | 1842.04 | 1679 | 0.911 | **-0.093** |
| GH | GGGCAC | 1828.97 | 1629 | 0.891 | **-0.116** |
| GH | GGTCAC | 1212.92 | 1008 | 0.831 | **-0.185** |
| GH | GGACAC | 1873.46 | 1479 | 0.789 | **-0.236** |
| GH | GGGCAT | 1326.31 | 928 | 0.700 | **-0.357** |
| GI | GGCATC | 3372.48 | 5474 | 1.623 | **0.484** |
| GI | GGAATA | 904.63 | 1338 | 1.479 | **0.391** |
| GI | GGAATT | 1966.96 | 2560 | 1.302 | **0.264** |
| GI | GGCATT | 2666.92 | 2670 | 1.001 | **0.001** |
| GI | GGTATT | 1273.45 | 1052 | 0.826 | **-0.191** |
| GI | GGGATC | 2428.27 | 1958 | 0.806 | **-0.215** |
| GI | GGTATA | 585.67 | 461 | 0.787 | **-0.239** |
| GI | GGAATC | 2487.34 | 1910 | 0.768 | **-0.264** |
| GI | GGGATA | 883.14 | 666 | 0.754 | **-0.282** |
| GI | GGGATT | 1920.24 | 1421 | 0.740 | **-0.301** |
| GI | GGCATA | 1226.55 | 885 | 0.722 | **-0.326** |
| GI | GGTATC | 1610.35 | 931 | 0.578 | **-0.548** |
| GK | GGAAAA | 3199.11 | 4553 | 1.423 | **0.353** |
| GK | GGGAAG | 4044.81 | 5674 | 1.403 | **0.338** |
| GK | GGGAAA | 3123.14 | 4119 | 1.319 | **0.277** |
| GK | GGCAAG | 5617.61 | 5712 | 1.017 | **0.017** |
| GK | GGAAAG | 4143.21 | 3706 | 0.894 | **-0.112** |
| GK | GGCAAA | 4337.55 | 3581 | 0.826 | **-0.192** |
| GK | GGTAAA | 2071.17 | 1334 | 0.644 | **-0.440** |
| GK | GGTAAG | 2682.40 | 540 | 0.201 | **-1.603** |
| GL | GGCCTC | 3017.19 | 4559 | 1.511 | **0.413** |
| GL | GGTTTA | 579.43 | 820 | 1.415 | **0.347** |
| GL | GGTTTG | 973.39 | 1294 | 1.329 | **0.285** |
| GL | GGGCTG | 4514.62 | 5878 | 1.302 | **0.264** |
| GL | GGTCTT | 993.42 | 1258 | 1.266 | **0.236** |
| GL | GGCCTG | 6270.10 | 7822 | 1.248 | **0.221** |
| GL | GGGCTC | 2172.45 | 2563 | 1.180 | **0.165** |
| GL | GGATTA | 894.98 | 991 | 1.107 | **0.102** |
| GL | GGACTT | 1534.44 | 1613 | 1.051 | **0.050** |
| GL | GGCTTG | 2038.53 | 2109 | 1.035 | **0.034** |
| GL | GGCCTT | 2080.48 | 2098 | 1.008 | **0.008** |
| GL | GGACTA | 827.51 | 799 | 0.966 | **-0.035** |
| GL | GGGCTT | 1497.99 | 1445 | 0.965 | **-0.036** |
| GL | GGTCTC | 1440.70 | 1365 | 0.947 | **-0.054** |
| GL | GGTCTA | 535.75 | 487 | 0.909 | **-0.095** |
| GL | GGGCTA | 807.86 | 726 | 0.899 | **-0.107** |
| GL | GGCCTA | 1121.99 | 968 | 0.863 | **-0.148** |
| GL | GGCTTA | 1213.47 | 935 | 0.771 | **-0.261** |
| GL | GGACTC | 2225.29 | 1656 | 0.744 | **-0.295** |
| GL | GGATTG | 1503.50 | 1062 | 0.706 | **-0.348** |
| GL | GGTCTG | 2993.96 | 2034 | 0.679 | **-0.387** |
| GL | GGGTTG | 1467.79 | 870 | 0.593 | **-0.523** |
| GL | GGGTTA | 873.73 | 467 | 0.534 | **-0.626** |

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| GL | GGACTG | 4624.44 | 2384 | 0.516 | **-0.663** |
| GM | GGCATG | 3177.11 | 3953 | 1.244 | **0.219** |
| GM | GGAATG | 2343.24 | 2482 | 1.059 | **0.058** |
| GM | GGGATG | 2287.59 | 2247 | 0.982 | **-0.018** |
| GM | GGTATG | 1517.06 | 643 | 0.424 | **-0.858** |
| GN | GGAAAT | 2150.19 | 3332 | 1.550 | **0.438** |
| GN | GGGAAC | 2311.93 | 2816 | 1.218 | **0.197** |
| GN | GGCAAC | 3210.92 | 3701 | 1.153 | **0.142** |
| GN | GGAAAC | 2368.18 | 2679 | 1.131 | **0.123** |
| GN | GGGAAT | 2099.13 | 1823 | 0.868 | **-0.141** |
| GN | GGCAAT | 2915.36 | 2061 | 0.707 | **-0.347** |
| GN | GGTAAT | 1392.08 | 784 | 0.563 | **-0.574** |
| GN | GGTAAC | 1533.21 | 785 | 0.512 | **-0.669** |
| GP | GGGCCC | 2634.22 | 3947 | 1.498 | **0.404** |
| GP | GGGCCG | 954.47 | 1417 | 1.485 | **0.395** |
| GP | GGCCCC | 3658.52 | 4576 | 1.251 | **0.224** |
| GP | GGCCCG | 1325.61 | 1623 | 1.224 | **0.202** |
| GP | GGTCCT | 1564.62 | 1910 | 1.221 | **0.199** |
| GP | GGGCCT | 2359.31 | 2542 | 1.077 | **0.075** |
| GP | GGTCCC | 1746.93 | 1827 | 1.046 | **0.045** |
| GP | GGCCCT | 3276.71 | 2994 | 0.914 | **-0.090** |
| GP | GGGCCA | 2277.03 | 2003 | 0.880 | **-0.128** |
| GP | GGTCCA | 1510.06 | 1264 | 0.837 | **-0.178** |
| GP | GGACCC | 2698.30 | 2240 | 0.830 | **-0.186** |
| GP | GGACCA | 2332.42 | 1908 | 0.818 | **-0.201** |
| GP | GGACCT | 2416.70 | 1957 | 0.810 | **-0.211** |
| GP | GGCCCA | 3162.44 | 2548 | 0.806 | **-0.216** |
| GP | GGTCCG | 632.98 | 351 | 0.555 | **-0.590** |
| GP | GGACCG | 977.69 | 421 | 0.431 | **-0.843** |
| GQ | GGACAA | 1382.58 | 1677 | 1.213 | **0.193** |
| GQ | GGGCAG | 3769.06 | 4425 | 1.174 | **0.160** |
| GQ | GGCCAG | 5234.64 | 6081 | 1.162 | **0.150** |
| GQ | GGTCAA | 895.11 | 953 | 1.065 | **0.063** |
| GQ | GGCCAA | 1874.58 | 1593 | 0.850 | **-0.163** |
| GQ | GGGCAA | 1349.74 | 1124 | 0.833 | **-0.183** |
| GQ | GGACAG | 3860.75 | 3134 | 0.812 | **-0.209** |
| GQ | GGTCAG | 2499.53 | 1879 | 0.752 | **-0.285** |
| GR | GGCCGC | 1832.29 | 3615 | 1.973 | **0.680** |
| GR | GGAAGA | 1490.60 | 2294 | 1.539 | **0.431** |
| GR | GGCCGG | 2003.98 | 2892 | 1.443 | **0.367** |
| GR | GGCCGT | 784.47 | 1022 | 1.303 | **0.265** |
| GR | GGTCGT | 374.58 | 450 | 1.201 | **0.183** |
| GR | GGCCGA | 1086.32 | 1252 | 1.153 | **0.142** |
| GR | GGGCGC | 1319.29 | 1471 | 1.115 | **0.109** |
| GR | GGTCGA | 518.71 | 546 | 1.053 | **0.051** |
| GR | GGCAGG | 1984.13 | 2022 | 1.019 | **0.019** |
| GR | GGGAGG | 1428.62 | 1435 | 1.004 | **0.004** |
| GR | GGGCGG | 1442.91 | 1437 | 0.996 | **-0.004** |
| GR | GGAAGG | 1463.37 | 1370 | 0.936 | **-0.066** |
| GR | GGGAGA | 1455.20 | 1344 | 0.924 | **-0.079** |
| GR | GGACGT | 578.58 | 514 | 0.888 | **-0.118** |
| GR | GGACGA | 801.20 | 671 | 0.837 | **-0.177** |
| GR | GGGCGT | 564.84 | 471 | 0.834 | **-0.182** |

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| GR | GGCAGA | 2021.05 | 1684 | 0.833 | **-0.182** |
| GR | GGGCGA | 782.17 | 626 | 0.800 | **-0.223** |
| GR | GGTCGC | 874.92 | 596 | 0.681 | **-0.384** |
| GR | GGTCGG | 956.90 | 555 | 0.580 | **-0.545** |
| GR | GGTAGA | 965.05 | 529 | 0.548 | **-0.601** |
| GR | GGACGC | 1351.39 | 729 | 0.539 | **-0.617** |
| GR | GGACGG | 1478.01 | 737 | 0.499 | **-0.696** |
| GR | GGTAGG | 947.42 | 244 | 0.258 | **-1.357** |
| GS | GGCAGC | 3581.32 | 6542 | 1.827 | **0.603** |
| GS | GGCTCC | 3161.05 | 5376 | 1.701 | **0.531** |
| GS | GGCTCG | 835.91 | 1323 | 1.583 | **0.459** |
| GS | GGCAGT | 2259.47 | 2875 | 1.272 | **0.241** |
| GS | GGAAGT | 1666.45 | 2085 | 1.251 | **0.224** |
| GS | GGTTCT | 1313.02 | 1563 | 1.190 | **0.174** |
| GS | GGCTCT | 2749.80 | 3087 | 1.123 | **0.116** |
| GS | GGGAGC | 2578.63 | 2566 | 0.995 | **-0.005** |
| GS | GGTTCC | 1509.39 | 1428 | 0.946 | **-0.055** |
| GS | GGCTCA | 2223.05 | 2101 | 0.945 | **-0.056** |
| GS | GGTTCA | 1061.50 | 981 | 0.924 | **-0.079** |
| GS | GGAAGC | 2641.36 | 2137 | 0.809 | **-0.212** |
| GS | GGATCA | 1639.59 | 1281 | 0.781 | **-0.247** |
| GS | GGGAGT | 1626.88 | 1267 | 0.779 | **-0.250** |
| GS | GGATCT | 2028.08 | 1470 | 0.725 | **-0.322** |
| GS | GGGTCC | 2276.03 | 1646 | 0.723 | **-0.324** |
| GS | GGGTCT | 1979.92 | 1280 | 0.646 | **-0.436** |
| GS | GGGTCG | 601.87 | 379 | 0.630 | **-0.463** |
| GS | GGTAGT | 1078.89 | 646 | 0.599 | **-0.513** |
| GS | GGATCC | 2331.40 | 1342 | 0.576 | **-0.552** |
| GS | GGGTCA | 1600.65 | 887 | 0.554 | **-0.590** |
| GS | GGTTCG | 399.14 | 209 | 0.524 | **-0.647** |
| GS | GGATCG | 616.51 | 276 | 0.448 | **-0.804** |
| GS | GGTAGC | 1710.07 | 723 | 0.423 | **-0.861** |
| GT | GGCACC | 3271.07 | 4870 | 1.489 | **0.398** |
| GT | GGCACG | 1074.53 | 1368 | 1.273 | **0.241** |
| GT | GGGACC | 2355.25 | 2817 | 1.196 | **0.179** |
| GT | GGAACA | 1953.05 | 2290 | 1.173 | **0.159** |
| GT | GGAACT | 1727.13 | 1900 | 1.100 | **0.095** |
| GT | GGGACG | 773.69 | 838 | 1.083 | **0.080** |
| GT | GGGACA | 1906.66 | 1903 | 0.998 | **-0.002** |
| GT | GGCACT | 2341.75 | 2331 | 0.995 | **-0.005** |
| GT | GGCACA | 2648.06 | 2499 | 0.944 | **-0.058** |
| GT | GGGACT | 1686.11 | 1534 | 0.910 | **-0.095** |
| GT | GGAACC | 2412.54 | 1841 | 0.763 | **-0.270** |
| GT | GGTACT | 1118.18 | 840 | 0.751 | **-0.286** |
| GT | GGTACC | 1561.93 | 994 | 0.636 | **-0.452** |
| GT | GGTACA | 1264.44 | 780 | 0.617 | **-0.483** |
| GT | GGAACG | 792.51 | 445 | 0.562 | **-0.577** |
| GT | GGTACG | 513.09 | 150 | 0.292 | **-1.230** |
| GV | GGTGTT | 816.93 | 1802 | 2.206 | **0.791** |
| GV | GGTGTC | 1045.94 | 2070 | 1.979 | **0.683** |
| GV | GGTGTA | 530.46 | 957 | 1.804 | **0.590** |
| GV | GGTGTG | 2069.18 | 3207 | 1.550 | **0.438** |
| GV | GGAGTA | 819.35 | 1225 | 1.495 | **0.402** |

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| --- | --- | --- | --- | --- | --- |
| GV | GGAGTT | 1261.83 | 1841 | 1.459 | **0.378** |
| GV | GGGGTC | 1577.18 | 2150 | 1.363 | **0.310** |
| GV | GGAGTC | 1615.55 | 1839 | 1.138 | **0.130** |
| GV | GGGGTT | 1231.86 | 1123 | 0.912 | **-0.093** |
| GV | GGGGTG | 3120.14 | 2770 | 0.888 | **-0.119** |
| GV | GGAGTG | 3196.04 | 2641 | 0.826 | **-0.191** |
| GV | GGGGTA | 799.89 | 631 | 0.789 | **-0.237** |
| GV | GGCGTC | 2190.46 | 1653 | 0.755 | **-0.282** |
| GV | GGCGTG | 4333.39 | 2790 | 0.644 | **-0.440** |
| GV | GGCGTT | 1710.87 | 499 | 0.292 | **-1.232** |
| GV | GGCGTA | 1110.93 | 232 | 0.209 | **-1.566** |
| GW | GGCTGG | 2102.85 | 3748 | 1.782 | **0.578** |
| GW | GGTTGG | 1004.11 | 690 | 0.687 | **-0.375** |
| GW | GGATGG | 1550.94 | 1012 | 0.653 | **-0.427** |
| GW | GGGTGG | 1514.10 | 722 | 0.477 | **-0.741** |
| GY | GGCTAC | 2577.81 | 4581 | 1.777 | **0.575** |
| GY | GGTTAT | 1000.20 | 1309 | 1.309 | **0.269** |
| GY | GGCTAT | 2094.66 | 2528 | 1.207 | **0.188** |
| GY | GGATAT | 1544.90 | 1478 | 0.957 | **-0.044** |
| GY | GGTTAC | 1230.90 | 1074 | 0.873 | **-0.136** |
| GY | GGATAC | 1901.24 | 1052 | 0.553 | **-0.592** |
| GY | GGGTAC | 1856.09 | 982 | 0.529 | **-0.637** |
| GY | GGGTAT | 1508.21 | 710 | 0.471 | **-0.753** |
| HA | CATGCT | 1101.90 | 1959 | 1.778 | **0.575** |
| HA | CATGCA | 964.61 | 1670 | 1.731 | **0.549** |
| HA | CATGCC | 1675.52 | 2408 | 1.437 | **0.363** |
| HA | CACGCG | 624.72 | 681 | 1.090 | **0.086** |
| HA | CATGCG | 453.03 | 447 | 0.987 | **-0.013** |
| HA | CACGCC | 2310.52 | 1649 | 0.714 | **-0.337** |
| HA | CACGCA | 1330.18 | 617 | 0.464 | **-0.768** |
| HA | CACGCT | 1519.52 | 549 | 0.361 | **-1.018** |
| HC | CACTGC | 1778.65 | 2629 | 1.478 | **0.391** |
| HC | CACTGT | 1498.13 | 1717 | 1.146 | **0.136** |
| HC | CATTGT | 1086.40 | 673 | 0.619 | **-0.479** |
| HC | CATTGC | 1289.82 | 634 | 0.492 | **-0.710** |
| HD | CATGAT | 1329.76 | 2349 | 1.766 | **0.569** |
| HD | CATGAC | 1502.11 | 2329 | 1.550 | **0.439** |
| HD | CACGAC | 2071.40 | 1343 | 0.648 | **-0.433** |
| HD | CACGAT | 1833.73 | 716 | 0.390 | **-0.940** |
| HE | CATGAA | 1769.46 | 3512 | 1.985 | **0.686** |
| HE | CATGAG | 2366.33 | 3307 | 1.398 | **0.335** |
| HE | CACGAG | 3263.15 | 2230 | 0.683 | **-0.381** |
| HE | CACGAA | 2440.07 | 790 | 0.324 | **-1.128** |
| HF | CACTTC | 2538.66 | 3116 | 1.227 | **0.205** |
| HF | CATTTT | 1608.41 | 1806 | 1.123 | **0.116** |
| HF | CACTTT | 2217.98 | 1884 | 0.849 | **-0.163** |
| HF | CATTTC | 1840.95 | 1400 | 0.760 | **-0.274** |
| HG | CATGGA | 1246.72 | 2238 | 1.795 | **0.585** |
| HG | CATGGT | 807.15 | 1426 | 1.767 | **0.569** |
| HG | CATGGG | 1217.11 | 1849 | 1.519 | **0.418** |
| HG | CATGGC | 1690.37 | 2320 | 1.372 | **0.317** |
| HG | CACGGC | 2331.01 | 1680 | 0.721 | **-0.328** |
| HG | CACGGG | 1678.38 | 1184 | 0.705 | **-0.349** |

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| --- | --- | --- | --- | --- | --- |
| HG | CACGGT | 1113.05 | 468 | 0.420 | **-0.866** |
| HG | CACGGA | 1719.21 | 638 | 0.371 | **-0.991** |
| HH | CACCAC | 2269.33 | 2795 | 1.232 | **0.208** |
| HH | CATCAT | 1193.37 | 1250 | 1.047 | **0.046** |
| HH | CACCAT | 1645.65 | 1453 | 0.883 | **-0.125** |
| HH | CATCAC | 1645.65 | 1256 | 0.763 | **-0.270** |
| HI | CACATC | 2433.52 | 3538 | 1.454 | **0.374** |
| HI | CACATT | 1924.40 | 1924 | 1.000 | **0.000** |
| HI | CACATA | 885.05 | 867 | 0.980 | **-0.021** |
| HI | CATATT | 1395.51 | 1260 | 0.903 | **-0.102** |
| HI | CATATA | 641.81 | 552 | 0.860 | **-0.151** |
| HI | CATATC | 1764.71 | 904 | 0.512 | **-0.669** |
| HK | CACAAG | 3102.81 | 3928 | 1.266 | **0.236** |
| HK | CACAAA | 2395.79 | 2432 | 1.015 | **0.015** |
| HK | CATAAA | 1737.35 | 1690 | 0.973 | **-0.028** |
| HK | CATAAG | 2250.06 | 1436 | 0.638 | **-0.449** |
| HL | CATTTA | 707.71 | 1053 | 1.488 | **0.397** |
| HL | CATTTG | 1188.90 | 1485 | 1.249 | **0.222** |
| HL | CACCTG | 5042.69 | 6030 | 1.196 | **0.179** |
| HL | CACCTC | 2426.56 | 2850 | 1.175 | **0.161** |
| HL | CATCTT | 1213.36 | 1409 | 1.161 | **0.149** |
| HL | CACTTG | 1639.48 | 1700 | 1.037 | **0.036** |
| HL | CATCTA | 654.36 | 649 | 0.992 | **-0.008** |
| HL | CACCTT | 1673.21 | 1499 | 0.896 | **-0.110** |
| HL | CACCTA | 902.35 | 761 | 0.843 | **-0.170** |
| HL | CATCTC | 1759.66 | 1422 | 0.808 | **-0.213** |
| HL | CACTTA | 975.93 | 781 | 0.800 | **-0.223** |
| HL | CATCTG | 3656.80 | 2202 | 0.602 | **-0.507** |
| HM | CACATG | 2348.18 | 3023 | 1.287 | **0.253** |
| HM | CATATG | 1702.82 | 1028 | 0.604 | **-0.505** |
| HN | CACAAC | 2031.88 | 2762 | 1.359 | **0.307** |
| HN | CACAAT | 1844.85 | 1832 | 0.993 | **-0.007** |
| HN | CATAAT | 1337.83 | 1225 | 0.916 | **-0.088** |
| HN | CATAAC | 1473.45 | 869 | 0.590 | **-0.528** |
| HP | CACCCG | 846.94 | 1341 | 1.583 | **0.460** |
| HP | CATCCT | 1518.15 | 1770 | 1.166 | **0.153** |
| HP | CACCCC | 2337.46 | 2530 | 1.082 | **0.079** |
| HP | CATCCA | 1465.21 | 1577 | 1.076 | **0.074** |
| HP | CACCCA | 2020.51 | 1919 | 0.950 | **-0.052** |
| HP | CACCCT | 2093.51 | 1859 | 0.888 | **-0.119** |
| HP | CATCCC | 1695.05 | 1265 | 0.746 | **-0.293** |
| HP | CATCCG | 614.18 | 330 | 0.537 | **-0.621** |
| HQ | CATCAA | 1143.96 | 1358 | 1.187 | **0.172** |
| HQ | CACCAG | 4405.09 | 4761 | 1.081 | **0.078** |
| HQ | CATCAG | 3194.43 | 2957 | 0.926 | **-0.077** |
| HQ | CACCAA | 1577.51 | 1245 | 0.789 | **-0.237** |
| HR | CACAGG | 1447.19 | 1936 | 1.338 | **0.291** |
| HR | CACCGC | 1336.44 | 1772 | 1.326 | **0.282** |
| HR | CACAGA | 1474.12 | 1788 | 1.213 | **0.193** |
| HR | CACCGG | 1461.67 | 1772 | 1.212 | **0.193** |
| HR | CACCGT | 572.18 | 667 | 1.166 | **0.153** |
| HR | CATCGA | 574.58 | 627 | 1.091 | **0.087** |
| HR | CATCGT | 414.93 | 452 | 1.089 | **0.086** |

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| --- | --- | --- | --- | --- | --- |
| HR | CACCGA | 792.34 | 855 | 1.079 | **0.076** |
| HR | CATCGG | 1059.96 | 729 | 0.688 | **-0.374** |
| HR | CATAGA | 1068.98 | 635 | 0.594 | **-0.521** |
| HR | CATCGC | 969.15 | 565 | 0.583 | **-0.540** |
| HR | CATAGG | 1049.46 | 423 | 0.403 | **-0.909** |
| HS | CACTCG | 551.81 | 880 | 1.595 | **0.467** |
| HS | CACAGC | 2364.16 | 3726 | 1.576 | **0.455** |
| HS | CACAGT | 1491.56 | 1957 | 1.312 | **0.272** |
| HS | CATTCA | 1064.20 | 1307 | 1.228 | **0.206** |
| HS | CATTCT | 1316.36 | 1517 | 1.152 | **0.142** |
| HS | CACTCC | 2086.72 | 1964 | 0.941 | **-0.061** |
| HS | CACTCA | 1467.52 | 1318 | 0.898 | **-0.107** |
| HS | CATTCC | 1513.23 | 1219 | 0.806 | **-0.216** |
| HS | CACTCT | 1815.24 | 1231 | 0.678 | **-0.388** |
| HS | CATAGT | 1081.63 | 710 | 0.656 | **-0.421** |
| HS | CATTCG | 400.16 | 256 | 0.640 | **-0.447** |
| HS | CATAGC | 1714.41 | 782 | 0.456 | **-0.785** |
| HT | CACACG | 778.62 | 1526 | 1.960 | **0.673** |
| HT | CACACT | 1696.86 | 2036 | 1.200 | **0.182** |
| HT | CACACA | 1918.82 | 2255 | 1.175 | **0.161** |
| HT | CACACC | 2370.26 | 2537 | 1.070 | **0.068** |
| HT | CATACT | 1230.51 | 1306 | 1.061 | **0.060** |
| HT | CATACA | 1391.46 | 979 | 0.704 | **-0.352** |
| HT | CATACC | 1718.84 | 806 | 0.469 | **-0.757** |
| HT | CATACG | 564.63 | 225 | 0.398 | **-0.920** |
| HV | CATGTT | 869.32 | 1563 | 1.798 | **0.587** |
| HV | CATGTA | 564.48 | 880 | 1.559 | **0.444** |
| HV | CATGTC | 1113.00 | 1607 | 1.444 | **0.367** |
| HV | CATGTG | 2201.86 | 2797 | 1.270 | **0.239** |
| HV | CACGTG | 3036.34 | 2579 | 0.849 | **-0.163** |
| HV | CACGTC | 1534.82 | 1158 | 0.754 | **-0.282** |
| HV | CACGTT | 1198.78 | 434 | 0.362 | **-1.016** |
| HV | CACGTA | 778.41 | 279 | 0.358 | **-1.026** |
| HW | CACTGG | 1602.74 | 2197 | 1.371 | **0.315** |
| HW | CATTGG | 1162.26 | 568 | 0.489 | **-0.716** |
| HY | CACTAC | 1943.40 | 2385 | 1.227 | **0.205** |
| HY | CATTAT | 1145.15 | 1240 | 1.083 | **0.080** |
| HY | CACTAT | 1579.16 | 1378 | 0.873 | **-0.136** |
| HY | CATTAC | 1409.29 | 1074 | 0.762 | **-0.272** |
| IA | ATTGCT | 1886.56 | 3678 | 1.950 | **0.668** |
| IA | ATAGCA | 759.54 | 1446 | 1.904 | **0.644** |
| IA | ATTGCA | 1651.49 | 2818 | 1.706 | **0.534** |
| IA | ATAGCT | 867.65 | 1289 | 1.486 | **0.396** |
| IA | ATTGCC | 2868.63 | 3435 | 1.197 | **0.180** |
| IA | ATAGCC | 1319.32 | 1191 | 0.903 | **-0.102** |
| IA | ATCGCG | 980.82 | 708 | 0.722 | **-0.326** |
| IA | ATCGCC | 3627.56 | 2570 | 0.708 | **-0.345** |
| IA | ATTGCG | 775.62 | 494 | 0.637 | **-0.451** |
| IA | ATAGCG | 356.72 | 198 | 0.555 | **-0.589** |
| IA | ATCGCA | 2088.41 | 831 | 0.398 | **-0.922** |
| IA | ATCGCT | 2385.67 | 910 | 0.381 | **-0.964** |
| IC | ATCTGC | 2115.05 | 3055 | 1.444 | **0.368** |
| IC | ATCTGT | 1781.48 | 2074 | 1.164 | **0.152** |

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| --- | --- | --- | --- | --- | --- |
| IC | ATATGT | 647.91 | 731 | 1.128 | **0.121** |
| IC | ATTTGT | 1408.77 | 1197 | 0.850 | **-0.163** |
| IC | ATATGC | 769.23 | 470 | 0.611 | **-0.493** |
| IC | ATTTGC | 1672.56 | 868 | 0.519 | **-0.656** |
| ID | ATTGAT | 2604.76 | 4341 | 1.667 | **0.511** |
| ID | ATAGAT | 1197.96 | 1947 | 1.625 | **0.486** |
| ID | ATTGAC | 2942.37 | 3938 | 1.338 | **0.291** |
| ID | ATAGAC | 1353.23 | 1476 | 1.091 | **0.087** |
| ID | ATCGAC | 3720.81 | 2270 | 0.610 | **-0.494** |
| ID | ATCGAT | 3293.87 | 1141 | 0.346 | **-1.060** |
| IE | ATAGAA | 1371.51 | 2939 | 2.143 | **0.762** |
| IE | ATTGAA | 2982.12 | 5518 | 1.850 | **0.615** |
| IE | ATTGAG | 3988.04 | 4634 | 1.162 | **0.150** |
| IE | ATAGAG | 1834.15 | 1898 | 1.035 | **0.034** |
| IE | ATCGAG | 5043.12 | 3007 | 0.596 | **-0.517** |
| IE | ATCGAA | 3771.07 | 994 | 0.264 | **-1.333** |
| IF | ATATTT | 1144.73 | 1929 | 1.685 | **0.522** |
| IF | ATCTTC | 3602.60 | 4836 | 1.342 | **0.294** |
| IF | ATTTTT | 2489.02 | 2226 | 0.894 | **-0.112** |
| IF | ATCTTT | 3147.52 | 2779 | 0.883 | **-0.125** |
| IF | ATATTC | 1310.24 | 886 | 0.676 | **-0.391** |
| IF | ATTTTC | 2848.89 | 1887 | 0.662 | **-0.412** |
| IG | ATTGGT | 1013.16 | 2102 | 2.075 | **0.730** |
| IG | ATTGGA | 1564.91 | 3151 | 2.014 | **0.700** |
| IG | ATAGGA | 719.72 | 1054 | 1.464 | **0.381** |
| IG | ATTGGG | 1527.75 | 2144 | 1.403 | **0.339** |
| IG | ATAGGT | 465.96 | 596 | 1.279 | **0.246** |
| IG | ATTGGC | 2121.81 | 2706 | 1.275 | **0.243** |
| IG | ATAGGG | 702.63 | 549 | 0.781 | **-0.247** |
| IG | ATAGGC | 975.84 | 700 | 0.717 | **-0.332** |
| IG | ATCGGG | 1931.93 | 1244 | 0.644 | **-0.440** |
| IG | ATCGGC | 2683.15 | 1619 | 0.603 | **-0.505** |
| IG | ATCGGT | 1281.20 | 498 | 0.389 | **-0.945** |
| IG | ATCGGA | 1978.93 | 604 | 0.305 | **-1.187** |
| IH | ATTCAT | 1622.93 | 2242 | 1.381 | **0.323** |
| IH | ATCCAC | 2830.09 | 3367 | 1.190 | **0.174** |
| IH | ATACAT | 746.40 | 760 | 1.018 | **0.018** |
| IH | ATCCAT | 2052.29 | 1814 | 0.884 | **-0.123** |
| IH | ATTCAC | 2238.00 | 1778 | 0.794 | **-0.230** |
| IH | ATACAC | 1029.28 | 558 | 0.542 | **-0.612** |
| II | ATCATC | 3797.03 | 5979 | 1.575 | **0.454** |
| II | ATAATA | 502.24 | 700 | 1.394 | **0.332** |
| II | ATAATT | 1092.04 | 1309 | 1.199 | **0.181** |
| II | ATCATT | 3002.64 | 3321 | 1.106 | **0.101** |
| II | ATTATT | 2374.46 | 2157 | 0.908 | **-0.096** |
| II | ATCATA | 1380.95 | 1183 | 0.857 | **-0.155** |
| II | ATTATA | 1092.04 | 921 | 0.843 | **-0.170** |
| II | ATAATC | 1380.95 | 715 | 0.518 | **-0.658** |
| II | ATTATC | 3002.64 | 1340 | 0.446 | **-0.807** |
| IK | ATAAAA | 1419.09 | 2244 | 1.581 | **0.458** |
| IK | ATCAAG | 5053.39 | 5884 | 1.164 | **0.152** |
| IK | ATAAAG | 1837.88 | 1943 | 1.057 | **0.056** |
| IK | ATTAAA | 3085.58 | 3107 | 1.007 | **0.007** |

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| --- | --- | --- | --- | --- | --- |
| IK | ATCAAA | 3901.90 | 3830 | 0.982 | **-0.019** |
| IK | ATTAAG | 3996.16 | 2286 | 0.572 | **-0.559** |
| IL | ATTTTA | 977.08 | 1679 | 1.718 | **0.541** |
| IL | ATATTA | 449.37 | 723 | 1.609 | **0.476** |
| IL | ATTTTG | 1641.41 | 2339 | 1.425 | **0.354** |
| IL | ATTCTT | 1675.18 | 2271 | 1.356 | **0.304** |
| IL | ATCCTC | 3072.14 | 4017 | 1.308 | **0.268** |
| IL | ATCCTG | 6384.29 | 7754 | 1.215 | **0.194** |
| IL | ATTCTA | 903.41 | 1021 | 1.130 | **0.122** |
| IL | ATCTTG | 2075.66 | 2250 | 1.084 | **0.081** |
| IL | ATCCTA | 1142.42 | 1170 | 1.024 | **0.024** |
| IL | ATACTA | 415.49 | 416 | 1.001 | **0.001** |
| IL | ATCCTT | 2118.37 | 2058 | 0.972 | **-0.029** |
| IL | ATATTG | 754.90 | 717 | 0.950 | **-0.052** |
| IL | ATACTT | 770.44 | 726 | 0.942 | **-0.059** |
| IL | ATCTTA | 1235.57 | 1077 | 0.872 | **-0.137** |
| IL | ATTCTC | 2429.41 | 1918 | 0.789 | **-0.236** |
| IL | ATTCTG | 5048.62 | 3005 | 0.595 | **-0.519** |
| IL | ATACTC | 1117.32 | 458 | 0.410 | **-0.892** |
| IL | ATACTG | 2321.92 | 934 | 0.402 | **-0.911** |
| IM | ATCATG | 3206.80 | 4314 | 1.345 | **0.297** |
| IM | ATAATG | 1166.29 | 1196 | 1.025 | **0.025** |
| IM | ATTATG | 2535.90 | 1399 | 0.552 | **-0.595** |
| IN | ATAAAT | 1088.42 | 1649 | 1.515 | **0.415** |
| IN | ATCAAC | 3296.07 | 4599 | 1.395 | **0.333** |
| IN | ATCAAT | 2992.68 | 2890 | 0.966 | **-0.035** |
| IN | ATAAAC | 1198.76 | 1113 | 0.928 | **-0.074** |
| IN | ATTAAT | 2366.58 | 1967 | 0.831 | **-0.185** |
| IN | ATTAAC | 2606.49 | 1331 | 0.511 | **-0.672** |
| IP | ATTCCT | 2051.78 | 2787 | 1.358 | **0.306** |
| IP | ATTCCA | 1980.23 | 2644 | 1.335 | **0.289** |
| IP | ATACCA | 910.73 | 1047 | 1.150 | **0.139** |
| IP | ATCCCC | 2896.94 | 3229 | 1.115 | **0.109** |
| IP | ATACCT | 943.64 | 995 | 1.054 | **0.053** |
| IP | ATCCCG | 1049.66 | 1073 | 1.022 | **0.022** |
| IP | ATCCCA | 2504.13 | 2366 | 0.945 | **-0.057** |
| IP | ATCCCT | 2594.61 | 2451 | 0.945 | **-0.057** |
| IP | ATTCCC | 2290.86 | 1775 | 0.775 | **-0.255** |
| IP | ATACCC | 1053.60 | 610 | 0.579 | **-0.547** |
| IP | ATTCCG | 830.06 | 386 | 0.465 | **-0.766** |
| IP | ATACCG | 381.76 | 125 | 0.327 | **-1.116** |
| IQ | ATACAA | 765.47 | 950 | 1.241 | **0.216** |
| IQ | ATTCAA | 1664.38 | 2045 | 1.229 | **0.206** |
| IQ | ATCCAG | 5877.26 | 6881 | 1.171 | **0.158** |
| IQ | ATTCAG | 4647.67 | 3987 | 0.858 | **-0.153** |
| IQ | ATCCAA | 2104.71 | 1765 | 0.839 | **-0.176** |
| IQ | ATACAG | 2137.52 | 1569 | 0.734 | **-0.309** |
| IR | ATCCGC | 1552.18 | 2623 | 1.690 | **0.525** |
| IR | ATTCGA | 727.72 | 1142 | 1.569 | **0.451** |
| IR | ATCCGA | 920.25 | 1434 | 1.558 | **0.444** |
| IR | ATCCGT | 664.55 | 943 | 1.419 | **0.350** |
| IR | ATAAGA | 622.67 | 877 | 1.408 | **0.342** |
| IR | ATCCGG | 1697.63 | 2265 | 1.334 | **0.288** |

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| --- | --- | --- | --- | --- | --- |
| IR | ATTCGT | 525.51 | 677 | 1.288 | **0.253** |
| IR | ATCAGA | 1712.09 | 1680 | 0.981 | **-0.019** |
| IR | ATCAGG | 1680.81 | 1513 | 0.900 | **-0.105** |
| IR | ATAAGG | 611.30 | 547 | 0.895 | **-0.111** |
| IR | ATACGT | 241.69 | 213 | 0.881 | **-0.126** |
| IR | ATACGA | 334.69 | 292 | 0.872 | **-0.136** |
| IR | ATTCGG | 1342.46 | 907 | 0.676 | **-0.392** |
| IR | ATTAGA | 1353.90 | 900 | 0.665 | **-0.408** |
| IR | ATTCGC | 1227.45 | 780 | 0.635 | **-0.453** |
| IR | ATACGG | 617.42 | 260 | 0.421 | **-0.865** |
| IR | ATTAGG | 1329.16 | 503 | 0.378 | **-0.972** |
| IR | ATACGC | 564.52 | 170 | 0.301 | **-1.200** |
| IS | ATCTCC | 2689.59 | 3743 | 1.392 | **0.330** |
| IS | ATATCA | 687.92 | 954 | 1.387 | **0.327** |
| IS | ATCAGC | 3047.17 | 3998 | 1.312 | **0.272** |
| IS | ATTTCT | 1850.19 | 2423 | 1.310 | **0.270** |
| IS | ATTTCA | 1495.77 | 1957 | 1.308 | **0.269** |
| IS | ATCAGT | 1922.48 | 2287 | 1.190 | **0.174** |
| IS | ATATCT | 850.92 | 1012 | 1.189 | **0.173** |
| IS | ATCTCG | 711.23 | 773 | 1.087 | **0.083** |
| IS | ATAAGT | 699.19 | 695 | 0.994 | **-0.006** |
| IS | ATCTCT | 2339.68 | 2317 | 0.990 | **-0.010** |
| IS | ATCTCA | 1891.49 | 1767 | 0.934 | **-0.068** |
| IS | ATTTCC | 2126.89 | 1795 | 0.844 | **-0.170** |
| IS | ATATCC | 978.18 | 703 | 0.719 | **-0.330** |
| IS | ATTAGT | 1520.28 | 906 | 0.596 | **-0.518** |
| IS | ATAAGC | 1108.24 | 636 | 0.574 | **-0.555** |
| IS | ATATCG | 258.67 | 132 | 0.510 | **-0.673** |
| IS | ATTTCG | 562.43 | 255 | 0.453 | **-0.791** |
| IS | ATTAGC | 2409.67 | 797 | 0.331 | **-1.106** |
| IT | ATCACC | 3094.94 | 4722 | 1.526 | **0.422** |
| IT | ATCACG | 1016.68 | 1306 | 1.285 | **0.250** |
| IT | ATAACT | 805.82 | 1009 | 1.252 | **0.225** |
| IT | ATCACT | 2215.66 | 2751 | 1.242 | **0.216** |
| IT | ATCACA | 2505.48 | 2989 | 1.193 | **0.176** |
| IT | ATAACA | 911.22 | 1079 | 1.184 | **0.169** |
| IT | ATTACT | 1752.12 | 1369 | 0.781 | **-0.247** |
| IT | ATTACA | 1981.30 | 1531 | 0.773 | **-0.258** |
| IT | ATAACC | 1125.61 | 741 | 0.658 | **-0.418** |
| IT | ATAACG | 369.76 | 204 | 0.552 | **-0.595** |
| IT | ATTACC | 2447.44 | 1083 | 0.443 | **-0.815** |
| IT | ATTACG | 803.98 | 246 | 0.306 | **-1.184** |
| IV | ATTGTT | 1261.28 | 2414 | 1.914 | **0.649** |
| IV | ATTGTA | 819.00 | 1478 | 1.805 | **0.590** |
| IV | ATAGTA | 376.67 | 645 | 1.712 | **0.538** |
| IV | ATAGTT | 580.08 | 877 | 1.512 | **0.413** |
| IV | ATTGTC | 1614.84 | 2315 | 1.434 | **0.360** |
| IV | ATTGTG | 3194.65 | 3762 | 1.178 | **0.163** |
| IV | ATCGTC | 2042.07 | 1679 | 0.822 | **-0.196** |
| IV | ATAGTG | 1469.26 | 1196 | 0.814 | **-0.206** |
| IV | ATAGTC | 742.69 | 575 | 0.774 | **-0.256** |
| IV | ATCGTG | 4039.83 | 2922 | 0.723 | **-0.324** |
| IV | ATCGTA | 1035.67 | 361 | 0.349 | **-1.054** |

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| IV | ATCGTT | 1594.97 | 547 | 0.343 | **-1.070** |
| IW | ATCTGG | 1887.23 | 2427 | 1.286 | **0.252** |
| IW | ATATGG | 686.37 | 622 | 0.906 | **-0.098** |
| IW | ATTTGG | 1492.40 | 1017 | 0.681 | **-0.384** |
| IY | ATCTAC | 2708.47 | 3486 | 1.287 | **0.252** |
| IY | ATATAT | 800.43 | 953 | 1.191 | **0.174** |
| IY | ATTTAT | 1740.39 | 1984 | 1.140 | **0.131** |
| IY | ATCTAT | 2200.83 | 2196 | 0.998 | **-0.002** |
| IY | ATTTAC | 2141.83 | 1403 | 0.655 | **-0.423** |
| IY | ATATAC | 985.05 | 555 | 0.563 | **-0.574** |
| KA | AAAGCA | 3029.93 | 4322 | 1.426 | **0.355** |
| KA | AAAGCT | 3461.21 | 4262 | 1.231 | **0.208** |
| KA | AAGGCC | 6816.15 | 6676 | 0.979 | **-0.021** |
| KA | AAGGCG | 1842.96 | 1790 | 0.971 | **-0.029** |
| KA | AAGGCA | 3924.10 | 3654 | 0.931 | **-0.071** |
| KA | AAAGCC | 5262.99 | 4742 | 0.901 | **-0.104** |
| KA | AAGGCT | 4482.65 | 4032 | 0.899 | **-0.106** |
| KA | AAAGCG | 1423.01 | 765 | 0.538 | **-0.621** |
| KC | AAATGT | 1815.55 | 2671 | 1.471 | **0.386** |
| KC | AAGTGT | 2351.33 | 2267 | 0.964 | **-0.037** |
| KC | AAGTGC | 2791.62 | 2498 | 0.895 | **-0.111** |
| KC | AAATGC | 2155.50 | 1678 | 0.778 | **-0.250** |
| KD | AAAGAT | 4684.00 | 6115 | 1.306 | **0.267** |
| KD | AAGGAC | 6852.58 | 6836 | 0.998 | **-0.002** |
| KD | AAGGAT | 6066.30 | 5379 | 0.887 | **-0.120** |
| KD | AAAGAC | 5291.12 | 4564 | 0.863 | **-0.148** |
| KE | AAAGAA | 6989.41 | 9895 | 1.416 | **0.348** |
| KE | AAGGAG | 12105.47 | 12287 | 1.015 | **0.015** |
| KE | AAGGAA | 9052.06 | 8366 | 0.924 | **-0.079** |
| KE | AAAGAG | 9347.06 | 6946 | 0.743 | **-0.297** |
| KF | AAATTT | 2631.62 | 3140 | 1.193 | **0.177** |
| KF | AAGTTT | 3408.25 | 3638 | 1.067 | **0.065** |
| KF | AAGTTC | 3901.02 | 3950 | 1.013 | **0.012** |
| KF | AAATTC | 3012.11 | 2225 | 0.739 | **-0.303** |
| KG | AAAGGA | 2672.15 | 4509 | 1.687 | **0.523** |
| KG | AAAGGT | 1730.00 | 2402 | 1.388 | **0.328** |
| KG | AAAGGC | 3623.06 | 3435 | 0.948 | **-0.053** |
| KG | AAAGGG | 2608.69 | 2465 | 0.945 | **-0.057** |
| KG | AAGGGC | 4692.27 | 4309 | 0.918 | **-0.085** |
| KG | AAGGGT | 2240.55 | 1978 | 0.883 | **-0.125** |
| KG | AAGGGG | 3378.54 | 2740 | 0.811 | **-0.209** |
| KG | AAGGGA | 3460.73 | 2568 | 0.742 | **-0.298** |
| KH | AAACAT | 1929.29 | 2356 | 1.221 | **0.200** |
| KH | AAGCAC | 3445.60 | 3583 | 1.040 | **0.039** |
| KH | AAGCAT | 2498.64 | 2430 | 0.973 | **-0.028** |
| KH | AAACAC | 2660.47 | 2165 | 0.814 | **-0.206** |
| KI | AAAATA | 1547.96 | 2667 | 1.723 | **0.544** |
| KI | AAAATT | 3365.76 | 3894 | 1.157 | **0.146** |
| KI | AAGATC | 5512.26 | 5523 | 1.002 | **0.002** |
| KI | AAGATA | 2004.77 | 1943 | 0.969 | **-0.031** |
| KI | AAGATT | 4359.03 | 3732 | 0.856 | **-0.155** |
| KI | AAAATC | 4256.21 | 3287 | 0.772 | **-0.258** |
| KK | AAGAAG | 11070.03 | 13815 | 1.248 | **0.222** |

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| --- | --- | --- | --- | --- | --- |
| KK | AAGAAA | 8547.55 | 10129 | 1.185 | **0.170** |
| KK | AAAAAG | 8547.55 | 6145 | 0.719 | **-0.330** |
| KK | AAAAAA | 6599.86 | 4676 | 0.708 | **-0.345** |
| KL | AAATTA | 1273.72 | 2084 | 1.636 | **0.492** |
| KL | AAACTA | 1177.70 | 1750 | 1.486 | **0.396** |
| KL | AAACTT | 2183.78 | 3014 | 1.380 | **0.322** |
| KL | AAGCTG | 8523.68 | 9600 | 1.126 | **0.119** |
| KL | AAGCTA | 1525.25 | 1660 | 1.088 | **0.085** |
| KL | AAGCTC | 4101.62 | 4076 | 0.994 | **-0.006** |
| KL | AAATTG | 2139.75 | 2113 | 0.987 | **-0.013** |
| KL | AAGCTT | 2828.24 | 2772 | 0.980 | **-0.020** |
| KL | AAGTTA | 1649.61 | 1459 | 0.884 | **-0.123** |
| KL | AAACTC | 3167.00 | 2653 | 0.838 | **-0.177** |
| KL | AAGTTG | 2771.21 | 2280 | 0.823 | **-0.195** |
| KL | AAACTG | 6581.43 | 4462 | 0.678 | **-0.389** |
| KM | AAGATG | 5479.27 | 5650 | 1.031 | **0.031** |
| KM | AAAATG | 4230.73 | 4060 | 0.960 | **-0.041** |
| KN | AAAAAT | 3683.47 | 4378 | 1.189 | **0.173** |
| KN | AAGAAC | 5254.13 | 5515 | 1.050 | **0.048** |
| KN | AAGAAT | 4770.51 | 4618 | 0.968 | **-0.032** |
| KN | AAAAAC | 4056.89 | 3254 | 0.802 | **-0.221** |
| KP | AAACCA | 2803.51 | 3370 | 1.202 | **0.184** |
| KP | AAGCCC | 4200.41 | 4673 | 1.113 | **0.107** |
| KP | AAGCCA | 3630.85 | 4035 | 1.111 | **0.106** |
| KP | AAACCT | 2904.80 | 3118 | 1.073 | **0.071** |
| KP | AAGCCG | 1521.96 | 1544 | 1.014 | **0.014** |
| KP | AAGCCT | 3762.04 | 3396 | 0.903 | **-0.102** |
| KP | AAACCC | 3243.28 | 2624 | 0.809 | **-0.212** |
| KP | AAACCG | 1175.16 | 482 | 0.410 | **-0.891** |
| KQ | AAACAA | 2178.87 | 3274 | 1.503 | **0.407** |
| KQ | AAGCAA | 2821.88 | 3177 | 1.126 | **0.119** |
| KQ | AAGCAG | 7879.90 | 8081 | 1.026 | **0.025** |
| KQ | AAACAG | 6084.35 | 4433 | 0.729 | **-0.317** |
| KR | AAAAGA | 2247.57 | 3147 | 1.400 | **0.337** |
| KR | AAGAGG | 2857.67 | 3975 | 1.391 | **0.330** |
| KR | AAGAGA | 2910.85 | 3511 | 1.206 | **0.187** |
| KR | AAAAGG | 2206.51 | 2325 | 1.054 | **0.052** |
| KR | AAACGT | 872.39 | 862 | 0.988 | **-0.012** |
| KR | AAGCGG | 2886.27 | 2828 | 0.980 | **-0.020** |
| KR | AAGCGC | 2638.99 | 2532 | 0.959 | **-0.041** |
| KR | AAACGA | 1208.07 | 1087 | 0.900 | **-0.106** |
| KR | AAGCGT | 1129.84 | 978 | 0.866 | **-0.144** |
| KR | AAGCGA | 1564.59 | 1325 | 0.847 | **-0.166** |
| KR | AAACGG | 2228.59 | 1178 | 0.529 | **-0.638** |
| KR | AAACGC | 2037.65 | 1041 | 0.511 | **-0.672** |
| KS | AAATCA | 1871.14 | 2533 | 1.354 | **0.303** |
| KS | AAAAGT | 1901.80 | 2389 | 1.256 | **0.228** |
| KS | AAATCT | 2314.50 | 2793 | 1.207 | **0.188** |
| KS | AAGTCA | 2423.33 | 2566 | 1.059 | **0.057** |
| KS | AAGAGC | 3903.97 | 4045 | 1.036 | **0.035** |
| KS | AAGAGT | 2463.04 | 2459 | 0.998 | **-0.002** |
| KS | AAGTCG | 911.22 | 904 | 0.992 | **-0.008** |
| KS | AAGTCC | 3445.84 | 3100 | 0.900 | **-0.106** |

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| --- | --- | --- | --- | --- | --- |
| KS | AAGTCT | 2997.54 | 2675 | 0.892 | **-0.114** |
| KS | AAATCC | 2660.65 | 2304 | 0.866 | **-0.144** |
| KS | AAAAGC | 3014.39 | 2381 | 0.790 | **-0.236** |
| KS | AAATCG | 703.58 | 462 | 0.657 | **-0.421** |
| KT | AAAACA | 2831.74 | 3611 | 1.275 | **0.243** |
| KT | AAGACG | 1488.17 | 1790 | 1.203 | **0.185** |
| KT | AAAACT | 2504.18 | 2969 | 1.186 | **0.170** |
| KT | AAGACC | 4530.26 | 4475 | 0.988 | **-0.012** |
| KT | AAGACA | 3667.42 | 3574 | 0.975 | **-0.026** |
| KT | AAGACT | 3243.20 | 2876 | 0.887 | **-0.120** |
| KT | AAAACC | 3497.97 | 2854 | 0.816 | **-0.203** |
| KT | AAAACG | 1149.07 | 763 | 0.664 | **-0.409** |
| KV | AAAGTA | 1317.00 | 2214 | 1.681 | **0.519** |
| KV | AAAGTT | 2028.22 | 3042 | 1.500 | **0.405** |
| KV | AAAGTC | 2596.78 | 2642 | 1.017 | **0.017** |
| KV | AAGGTG | 6653.25 | 6512 | 0.979 | **-0.021** |
| KV | AAGGTC | 3363.11 | 3016 | 0.897 | **-0.109** |
| KV | AAGGTT | 2626.77 | 2294 | 0.873 | **-0.135** |
| KV | AAAGTG | 5137.21 | 4417 | 0.860 | **-0.151** |
| KV | AAGGTA | 1705.66 | 1291 | 0.757 | **-0.279** |
| KW | AAGTGG | 2598.56 | 2701 | 1.039 | **0.039** |
| KW | AAATGG | 2006.44 | 1904 | 0.949 | **-0.052** |
| KY | AAATAT | 2319.32 | 2982 | 1.286 | **0.251** |
| KY | AAGTAC | 3696.62 | 3603 | 0.975 | **-0.026** |
| KY | AAATAC | 2854.29 | 2763 | 0.968 | **-0.033** |
| KY | AAGTAT | 3003.78 | 2526 | 0.841 | **-0.173** |
| LA | CTGGCG | 2275.39 | 3643 | 1.601 | **0.471** |
| LA | TTGGCA | 1575.16 | 2350 | 1.492 | **0.400** |
| LA | CTGGCC | 8415.49 | 12456 | 1.480 | **0.392** |
| LA | TTGGCT | 1799.36 | 2643 | 1.469 | **0.384** |
| LA | TTAGCA | 937.64 | 1314 | 1.401 | **0.337** |
| LA | CTTGCT | 1836.39 | 2345 | 1.277 | **0.244** |
| LA | CTAGCA | 866.95 | 1107 | 1.277 | **0.244** |
| LA | CTTGCA | 1607.57 | 1861 | 1.158 | **0.146** |
| LA | TTAGCT | 1071.10 | 1239 | 1.157 | **0.146** |
| LA | CTGGCT | 5534.46 | 6333 | 1.144 | **0.135** |
| LA | CTAGCT | 990.35 | 1099 | 1.110 | **0.104** |
| LA | CTGGCA | 4844.85 | 5013 | 1.035 | **0.034** |
| LA | TTGGCC | 2736.04 | 2824 | 1.032 | **0.032** |
| LA | TTGGCG | 739.77 | 623 | 0.842 | **-0.172** |
| LA | CTTGCC | 2792.34 | 2201 | 0.788 | **-0.238** |
| LA | CTAGCC | 1505.89 | 1159 | 0.770 | **-0.262** |
| LA | CTAGCG | 407.16 | 253 | 0.621 | **-0.476** |
| LA | TTAGCC | 1628.68 | 941 | 0.578 | **-0.549** |
| LA | CTTGCG | 755.00 | 346 | 0.458 | **-0.780** |
| LA | TTAGCG | 440.36 | 198 | 0.450 | **-0.799** |
| LA | CTCGCC | 4049.56 | 1527 | 0.377 | **-0.975** |
| LA | CTCGCG | 1094.93 | 390 | 0.356 | **-1.032** |
| LA | CTCGCT | 2663.20 | 605 | 0.227 | **-1.482** |
| LA | CTCGCA | 2331.36 | 429 | 0.184 | **-1.693** |
| LC | CTCTGC | 1769.27 | 3523 | 1.991 | **0.689** |
| LC | CTCTGT | 1490.23 | 2145 | 1.439 | **0.364** |
| LC | CTTTGT | 1027.58 | 1155 | 1.124 | **0.117** |

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| LC | TTATGT | 599.35 | 627 | 1.046 | **0.045** |
| LC | CTGTGC | 3676.77 | 3517 | 0.957 | **-0.044** |
| LC | TTGTGT | 1006.86 | 856 | 0.850 | **-0.162** |
| LC | CTTTGC | 1219.99 | 974 | 0.798 | **-0.225** |
| LC | CTGTGT | 3096.89 | 2370 | 0.765 | **-0.268** |
| LC | CTATGT | 554.17 | 417 | 0.752 | **-0.284** |
| LC | TTGTGC | 1195.39 | 722 | 0.604 | **-0.504** |
| LC | TTATGC | 711.58 | 368 | 0.517 | **-0.659** |
| LC | CTATGC | 657.93 | 332 | 0.505 | **-0.684** |
| LD | TTGGAT | 2174.51 | 3688 | 1.696 | **0.528** |
| LD | TTAGAT | 1294.41 | 1977 | 1.527 | **0.424** |
| LD | CTGGAC | 7555.23 | 10531 | 1.394 | **0.332** |
| LD | CTAGAT | 1196.83 | 1584 | 1.323 | **0.280** |
| LD | TTGGAC | 2456.35 | 2775 | 1.130 | **0.122** |
| LD | CTTGAT | 2219.25 | 2463 | 1.110 | **0.104** |
| LD | CTGGAT | 6688.33 | 6912 | 1.033 | **0.033** |
| LD | CTAGAC | 1351.95 | 1390 | 1.028 | **0.028** |
| LD | CTTGAC | 2506.90 | 1832 | 0.731 | **-0.314** |
| LD | TTAGAC | 1462.19 | 969 | 0.663 | **-0.411** |
| LD | CTCGAC | 3635.60 | 981 | 0.270 | **-1.310** |
| LD | CTCGAT | 3218.44 | 658 | 0.204 | **-1.587** |
| LE | TTAGAA | 1739.66 | 3085 | 1.773 | **0.573** |
| LE | CTAGAA | 1608.51 | 2701 | 1.679 | **0.518** |
| LE | TTGGAA | 2922.49 | 4652 | 1.592 | **0.465** |
| LE | CTGGAG | 12021.09 | 18044 | 1.501 | **0.406** |
| LE | TTGGAG | 3908.29 | 4774 | 1.222 | **0.200** |
| LE | CTAGAG | 2151.09 | 2515 | 1.169 | **0.156** |
| LE | CTTGAA | 2982.63 | 3161 | 1.060 | **0.058** |
| LE | CTGGAA | 8988.96 | 7642 | 0.850 | **-0.162** |
| LE | TTAGAG | 2326.48 | 1873 | 0.805 | **-0.217** |
| LE | CTTGAG | 3988.72 | 2484 | 0.623 | **-0.474** |
| LE | CTCGAG | 5784.58 | 1305 | 0.226 | **-1.489** |
| LE | CTCGAA | 4325.51 | 512 | 0.118 | **-2.134** |
| LF | CTCTTC | 2629.18 | 6495 | 2.470 | **0.904** |
| LF | TTATTT | 923.85 | 1405 | 1.521 | **0.419** |
| LF | CTCTTT | 2297.07 | 3446 | 1.500 | **0.406** |
| LF | CTTTTT | 1583.93 | 1937 | 1.223 | **0.201** |
| LF | CTTTTC | 1812.93 | 1936 | 1.068 | **0.066** |
| LF | CTATTT | 854.20 | 876 | 1.026 | **0.025** |
| LF | TTGTTT | 1551.99 | 1544 | 0.995 | **-0.005** |
| LF | CTGTTT | 4773.59 | 2957 | 0.619 | **-0.479** |
| LF | CTGTTC | 5463.77 | 3119 | 0.571 | **-0.561** |
| LF | TTATTC | 1057.42 | 583 | 0.551 | **-0.595** |
| LF | TTGTTC | 1776.38 | 940 | 0.529 | **-0.636** |
| LF | CTATTC | 977.70 | 464 | 0.475 | **-0.745** |
| LG | CTTGGA | 1534.14 | 2667 | 1.738 | **0.553** |
| LG | CTTGGT | 993.23 | 1579 | 1.590 | **0.464** |
| LG | CTGGGC | 6268.87 | 9794 | 1.562 | **0.446** |
| LG | CTAGGA | 827.35 | 1087 | 1.314 | **0.273** |
| LG | CTTGGG | 1497.70 | 1881 | 1.256 | **0.228** |
| LG | TTAGGA | 894.81 | 1114 | 1.245 | **0.219** |
| LG | CTGGGG | 4513.74 | 5602 | 1.241 | **0.216** |
| LG | TTGGGT | 973.20 | 1194 | 1.227 | **0.204** |

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| --- | --- | --- | --- | --- | --- |
| LG | TTGGGA | 1503.20 | 1820 | 1.211 | **0.191** |
| LG | CTAGGT | 535.64 | 611 | 1.141 | **0.132** |
| LG | TTAGGT | 579.32 | 611 | 1.055 | **0.053** |
| LG | TTGGGG | 1467.50 | 1452 | 0.989 | **-0.011** |
| LG | CTGGGT | 2993.37 | 2947 | 0.985 | **-0.016** |
| LG | CTTGGC | 2080.08 | 2009 | 0.966 | **-0.035** |
| LG | CTAGGG | 807.70 | 766 | 0.948 | **-0.053** |
| LG | TTGGGC | 2038.13 | 1786 | 0.876 | **-0.132** |
| LG | CTGGGA | 4623.54 | 4034 | 0.872 | **-0.136** |
| LG | CTAGGC | 1121.77 | 940 | 0.838 | **-0.177** |
| LG | TTAGGG | 873.56 | 529 | 0.606 | **-0.502** |
| LG | CTCGGG | 2172.02 | 1076 | 0.495 | **-0.702** |
| LG | CTCGGC | 3016.60 | 1313 | 0.435 | **-0.832** |
| LG | TTAGGC | 1213.24 | 507 | 0.418 | **-0.873** |
| LG | CTCGGT | 1440.42 | 365 | 0.253 | **-1.373** |
| LG | CTCGGA | 2224.86 | 510 | 0.229 | **-1.473** |
| LH | CTTCAT | 1127.31 | 1980 | 1.756 | **0.563** |
| LH | TTACAT | 657.52 | 935 | 1.422 | **0.352** |
| LH | CTACAT | 607.95 | 741 | 1.219 | **0.198** |
| LH | CTGCAC | 4685.05 | 5459 | 1.165 | **0.153** |
| LH | CTCCAC | 2254.46 | 2204 | 0.978 | **-0.023** |
| LH | CTTCAC | 1554.55 | 1490 | 0.958 | **-0.042** |
| LH | CTCCAT | 1634.86 | 1521 | 0.930 | **-0.072** |
| LH | CTACAC | 838.36 | 777 | 0.927 | **-0.076** |
| LH | TTGCAT | 1104.58 | 1017 | 0.921 | **-0.083** |
| LH | TTGCAC | 1523.20 | 1140 | 0.748 | **-0.290** |
| LH | CTGCAT | 3397.45 | 2394 | 0.705 | **-0.350** |
| LH | TTACAC | 906.71 | 634 | 0.699 | **-0.358** |
| LI | CTCATC | 2602.42 | 6250 | 2.402 | **0.876** |
| LI | TTAATA | 380.66 | 798 | 2.096 | **0.740** |
| LI | TTAATT | 827.68 | 1290 | 1.559 | **0.444** |
| LI | CTCATT | 2057.96 | 3117 | 1.515 | **0.415** |
| LI | CTAATA | 351.96 | 516 | 1.466 | **0.383** |
| LI | CTAATT | 765.28 | 952 | 1.244 | **0.218** |
| LI | CTTATT | 1419.05 | 1761 | 1.241 | **0.216** |
| LI | TTGATA | 639.48 | 791 | 1.237 | **0.213** |
| LI | TTGATT | 1390.44 | 1468 | 1.056 | **0.054** |
| LI | CTTATA | 652.64 | 683 | 1.047 | **0.045** |
| LI | CTCATA | 946.48 | 919 | 0.971 | **-0.029** |
| LI | CTTATC | 1794.48 | 1189 | 0.663 | **-0.412** |
| LI | TTGATC | 1758.29 | 1135 | 0.646 | **-0.438** |
| LI | CTGATC | 5408.15 | 3356 | 0.621 | **-0.477** |
| LI | CTGATT | 4276.70 | 2639 | 0.617 | **-0.483** |
| LI | CTGATA | 1966.91 | 1193 | 0.607 | **-0.500** |
| LI | TTAATC | 1046.66 | 633 | 0.605 | **-0.503** |
| LI | CTAATC | 967.75 | 563 | 0.582 | **-0.542** |
| LK | TTAAAA | 1429.91 | 2557 | 1.788 | **0.581** |
| LK | CTAAAA | 1322.10 | 1842 | 1.393 | **0.332** |
| LK | TTGAAA | 2402.12 | 3193 | 1.329 | **0.285** |
| LK | CTCAAG | 4604.55 | 6048 | 1.313 | **0.273** |
| LK | CTAAAG | 1712.27 | 2078 | 1.214 | **0.194** |
| LK | TTAAAG | 1851.89 | 2128 | 1.149 | **0.139** |
| LK | CTGAAG | 9568.82 | 10212 | 1.067 | **0.065** |

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| --- | --- | --- | --- | --- | --- |
| LK | TTGAAG | 3111.01 | 3222 | 1.036 | **0.035** |
| LK | CTCAAA | 3555.33 | 2768 | 0.779 | **-0.250** |
| LK | CTTAAA | 2451.55 | 1850 | 0.755 | **-0.282** |
| LK | CTGAAA | 7388.42 | 5227 | 0.707 | **-0.346** |
| LK | CTTAAG | 3175.03 | 1448 | 0.456 | **-0.785** |
| LL | TTATTA | 500.55 | 802 | 1.602 | **0.471** |
| LL | CTTCTA | 793.49 | 1132 | 1.427 | **0.355** |
| LL | CTTCTT | 1471.36 | 2099 | 1.427 | **0.355** |
| LL | CTTTTA | 858.19 | 1203 | 1.402 | **0.338** |
| LL | CTGCTG | 13364.10 | 18236 | 1.365 | **0.311** |
| LL | CTTTTG | 1441.69 | 1945 | 1.349 | **0.299** |
| LL | TTACTA | 462.82 | 608 | 1.314 | **0.273** |
| LL | CTCCTC | 3094.54 | 3800 | 1.228 | **0.205** |
| LL | CTCCTG | 6430.85 | 7786 | 1.211 | **0.191** |
| LL | TTACTT | 858.19 | 1039 | 1.211 | **0.191** |
| LL | TTGCTA | 777.49 | 929 | 1.195 | **0.178** |
| LL | CTGCTC | 6430.85 | 7550 | 1.174 | **0.160** |
| LL | CTACTA | 427.93 | 474 | 1.108 | **0.102** |
| LL | CTTCTC | 2133.82 | 2292 | 1.074 | **0.072** |
| LL | CTACTT | 793.49 | 839 | 1.057 | **0.056** |
| LL | CTCTTG | 2090.79 | 2131 | 1.019 | **0.019** |
| LL | TTGCTT | 1441.69 | 1464 | 1.015 | **0.015** |
| LL | TTATTG | 840.89 | 818 | 0.973 | **-0.028** |
| LL | CTCCTT | 2133.82 | 2034 | 0.953 | **-0.048** |
| LL | TTGTTA | 840.89 | 771 | 0.917 | **-0.087** |
| LL | TTGTTG | 1412.62 | 1289 | 0.912 | **-0.092** |
| LL | CTCCTA | 1150.75 | 1034 | 0.899 | **-0.107** |
| LL | TTGCTG | 4344.93 | 3820 | 0.879 | **-0.129** |
| LL | CTTCTG | 4434.34 | 3837 | 0.865 | **-0.145** |
| LL | CTGCTA | 2391.41 | 1913 | 0.800 | **-0.223** |
| LL | CTCTTA | 1244.58 | 959 | 0.771 | **-0.261** |
| LL | CTATTA | 462.82 | 354 | 0.765 | **-0.268** |
| LL | CTGCTT | 4434.34 | 3148 | 0.710 | **-0.343** |
| LL | TTGCTC | 2090.79 | 1440 | 0.689 | **-0.373** |
| LL | CTACTC | 1150.75 | 792 | 0.688 | **-0.374** |
| LL | CTATTG | 777.49 | 532 | 0.684 | **-0.379** |
| LL | CTACTG | 2391.41 | 1583 | 0.662 | **-0.413** |
| LL | CTGTTG | 4344.93 | 2615 | 0.602 | **-0.508** |
| LL | TTACTC | 1244.58 | 657 | 0.528 | **-0.639** |
| LL | TTACTG | 2586.40 | 1358 | 0.525 | **-0.644** |
| LL | CTGTTA | 2586.40 | 953 | 0.368 | **-0.998** |
| LM | CTCATG | 2631.41 | 4030 | 1.531 | **0.426** |
| LM | TTAATG | 1058.32 | 1228 | 1.160 | **0.149** |
| LM | CTAATG | 978.53 | 1101 | 1.125 | **0.118** |
| LM | TTGATG | 1777.88 | 1763 | 0.992 | **-0.008** |
| LM | CTGATG | 5468.39 | 4470 | 0.817 | **-0.202** |
| LM | CTTATG | 1814.47 | 1137 | 0.627 | **-0.467** |
| LN | TTAAAT | 962.36 | 1926 | 2.001 | **0.694** |
| LN | CTCAAC | 2635.40 | 4681 | 1.776 | **0.574** |
| LN | CTAAAT | 889.81 | 1446 | 1.625 | **0.486** |
| LN | TTGAAT | 1616.68 | 2048 | 1.267 | **0.236** |
| LN | CTCAAT | 2392.82 | 2652 | 1.108 | **0.103** |
| LN | CTAAAC | 980.01 | 922 | 0.941 | **-0.061** |

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| --- | --- | --- | --- | --- | --- |
| LN | TTAAAC | 1059.92 | 965 | 0.910 | **-0.094** |
| LN | CTTAAT | 1649.95 | 1441 | 0.873 | **-0.135** |
| LN | TTGAAC | 1780.58 | 1541 | 0.865 | **-0.145** |
| LN | CTGAAC | 5476.68 | 4308 | 0.787 | **-0.240** |
| LN | CTGAAT | 4972.58 | 3413 | 0.686 | **-0.376** |
| LN | CTTAAC | 1817.22 | 891 | 0.490 | **-0.713** |
| LP | CTTCCT | 1728.14 | 2795 | 1.617 | **0.481** |
| LP | CTTCCA | 1667.88 | 2369 | 1.420 | **0.351** |
| LP | CTGCCC | 5815.10 | 7856 | 1.351 | **0.301** |
| LP | TTACCT | 1007.96 | 1244 | 1.234 | **0.210** |
| LP | CTGCCG | 2107.02 | 2489 | 1.181 | **0.167** |
| LP | TTACCA | 972.81 | 1140 | 1.172 | **0.159** |
| LP | CTCCCG | 1013.90 | 1184 | 1.168 | **0.155** |
| LP | TTGCCA | 1634.25 | 1897 | 1.161 | **0.149** |
| LP | CTACCT | 931.97 | 1045 | 1.121 | **0.114** |
| LP | TTGCCT | 1693.30 | 1800 | 1.063 | **0.061** |
| LP | CTTCCC | 1929.51 | 1889 | 0.979 | **-0.021** |
| LP | CTACCA | 899.47 | 850 | 0.945 | **-0.057** |
| LP | CTCCCA | 2418.82 | 2126 | 0.879 | **-0.129** |
| LP | CTGCCT | 5208.23 | 4563 | 0.876 | **-0.132** |
| LP | CTCCCT | 2506.21 | 2192 | 0.875 | **-0.134** |
| LP | CTACCC | 1040.57 | 888 | 0.853 | **-0.159** |
| LP | CTCCCC | 2798.25 | 2369 | 0.847 | **-0.167** |
| LP | TTGCCC | 1890.60 | 1560 | 0.825 | **-0.192** |
| LP | TTGCCG | 685.03 | 478 | 0.698 | **-0.360** |
| LP | CTGCCA | 5026.60 | 3348 | 0.666 | **-0.406** |
| LP | CTTCCG | 699.13 | 451 | 0.645 | **-0.438** |
| LP | TTACCC | 1125.42 | 666 | 0.592 | **-0.525** |
| LP | CTACCG | 377.04 | 211 | 0.560 | **-0.580** |
| LP | TTACCG | 407.78 | 175 | 0.429 | **-0.846** |
| LQ | TTACAA | 864.28 | 1290 | 1.493 | **0.401** |
| LQ | CTACAA | 799.12 | 1188 | 1.487 | **0.397** |
| LQ | CTTCAA | 1481.79 | 2098 | 1.416 | **0.348** |
| LQ | CTACAG | 2231.48 | 2674 | 1.198 | **0.181** |
| LQ | CTGCAG | 12470.36 | 14508 | 1.163 | **0.151** |
| LQ | CTTCAG | 4137.79 | 4363 | 1.054 | **0.053** |
| LQ | TTGCAA | 1451.91 | 1467 | 1.010 | **0.010** |
| LQ | CTCCAG | 6000.78 | 5430 | 0.905 | **-0.100** |
| LQ | TTACAG | 2413.43 | 2107 | 0.873 | **-0.136** |
| LQ | TTGCAG | 4054.36 | 3177 | 0.784 | **-0.244** |
| LQ | CTCCAA | 2148.94 | 1524 | 0.709 | **-0.344** |
| LQ | CTGCAA | 4465.77 | 2694 | 0.603 | **-0.505** |
| LR | CTTCGA | 661.43 | 1365 | 2.064 | **0.725** |
| LR | CTTCGT | 477.64 | 784 | 1.641 | **0.496** |
| LR | CTGCGG | 3677.31 | 5467 | 1.487 | **0.397** |
| LR | TTAAGA | 717.74 | 1026 | 1.429 | **0.357** |
| LR | CTGCGC | 3362.26 | 4574 | 1.360 | **0.308** |
| LR | CTCCGA | 959.23 | 1289 | 1.344 | **0.295** |
| LR | CTCCGG | 1769.53 | 2229 | 1.260 | **0.231** |
| LR | CTAAGA | 663.63 | 821 | 1.237 | **0.213** |
| LR | CTCAGG | 1752.00 | 2047 | 1.168 | **0.156** |
| LR | CTTCGG | 1220.17 | 1415 | 1.160 | **0.148** |
| LR | CTCCGT | 692.69 | 771 | 1.113 | **0.107** |

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| --- | --- | --- | --- | --- | --- |
| LR | TTACGA | 385.79 | 427 | 1.107 | **0.101** |
| LR | CTAAGG | 651.51 | 721 | 1.107 | **0.101** |
| LR | CTCCGC | 1617.93 | 1790 | 1.106 | **0.101** |
| LR | TTGAGA | 1205.75 | 1290 | 1.070 | **0.068** |
| LR | CTACGT | 257.59 | 275 | 1.068 | **0.065** |
| LR | CTACGA | 356.70 | 378 | 1.060 | **0.058** |
| LR | CTGAGG | 3640.88 | 3637 | 0.999 | **-0.001** |
| LR | TTAAGG | 704.63 | 678 | 0.962 | **-0.039** |
| LR | TTACGT | 278.59 | 264 | 0.948 | **-0.054** |
| LR | CTGCGT | 1439.50 | 1363 | 0.947 | **-0.055** |
| LR | TTGAGG | 1183.72 | 1080 | 0.912 | **-0.092** |
| LR | CTACGG | 658.03 | 577 | 0.877 | **-0.131** |
| LR | CTCAGA | 1784.60 | 1469 | 0.823 | **-0.195** |
| LR | CTTCGC | 1115.63 | 819 | 0.734 | **-0.309** |
| LR | CTACGC | 601.65 | 438 | 0.728 | **-0.317** |
| LR | CTGCGA | 1993.40 | 1399 | 0.702 | **-0.354** |
| LR | TTGCGT | 468.01 | 321 | 0.686 | **-0.377** |
| LR | CTGAGA | 3708.63 | 2486 | 0.670 | **-0.400** |
| LR | TTGCGG | 1195.56 | 772 | 0.646 | **-0.437** |
| LR | TTGCGA | 648.09 | 418 | 0.645 | **-0.439** |
| LR | CTTAGA | 1230.56 | 694 | 0.564 | **-0.573** |
| LR | TTACGG | 711.68 | 383 | 0.538 | **-0.620** |
| LR | TTGCGC | 1093.14 | 542 | 0.496 | **-0.702** |
| LR | CTTAGG | 1208.08 | 503 | 0.416 | **-0.876** |
| LR | TTACGC | 650.71 | 232 | 0.357 | **-1.031** |
| LS | CTCAGC | 2740.30 | 5167 | 1.886 | **0.634** |
| LS | CTTTCT | 1450.83 | 2502 | 1.725 | **0.545** |
| LS | CTCTCC | 2418.72 | 4070 | 1.683 | **0.520** |
| LS | CTCTCG | 639.61 | 1016 | 1.588 | **0.463** |
| LS | CTCAGT | 1728.87 | 2589 | 1.498 | **0.404** |
| LS | TTATCA | 684.12 | 963 | 1.408 | **0.342** |
| LS | TTATCT | 846.22 | 1175 | 1.389 | **0.328** |
| LS | CTTTCA | 1172.91 | 1626 | 1.386 | **0.327** |
| LS | TTAAGT | 695.33 | 886 | 1.274 | **0.242** |
| LS | CTCTCT | 2104.05 | 2553 | 1.213 | **0.193** |
| LS | CTAAGT | 642.91 | 770 | 1.198 | **0.180** |
| LS | CTCTCA | 1701.00 | 2003 | 1.178 | **0.163** |
| LS | CTTTCC | 1667.81 | 1819 | 1.091 | **0.087** |
| LS | TTGTCA | 1149.26 | 1210 | 1.053 | **0.052** |
| LS | CTGTCG | 1329.18 | 1392 | 1.047 | **0.046** |
| LS | TTGTCT | 1421.58 | 1461 | 1.028 | **0.027** |
| LS | CTGAGC | 5694.68 | 5805 | 1.019 | **0.019** |
| LS | CTGTCC | 5026.41 | 4628 | 0.921 | **-0.083** |
| LS | TTGAGT | 1168.09 | 1035 | 0.886 | **-0.121** |
| LS | TTGTCC | 1634.18 | 1334 | 0.816 | **-0.203** |
| LS | CTATCA | 632.54 | 512 | 0.809 | **-0.211** |
| LS | CTAAGC | 1019.02 | 791 | 0.776 | **-0.253** |
| LS | TTATCC | 972.78 | 727 | 0.747 | **-0.291** |
| LS | CTGAGT | 3592.81 | 2665 | 0.742 | **-0.299** |
| LS | CTTAGT | 1192.13 | 856 | 0.718 | **-0.331** |
| LS | CTATCT | 782.42 | 557 | 0.712 | **-0.340** |
| LS | CTGTCT | 4372.48 | 2950 | 0.675 | **-0.394** |
| LS | CTTTCG | 441.04 | 291 | 0.660 | **-0.416** |

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| --- | --- | --- | --- | --- | --- |
| LS | TTGTCG | 432.14 | 278 | 0.643 | **-0.441** |
| LS | CTGTCA | 3534.89 | 2228 | 0.630 | **-0.462** |
| LS | TTGAGC | 1851.45 | 1128 | 0.609 | **-0.496** |
| LS | CTATCC | 899.44 | 541 | 0.601 | **-0.508** |
| LS | TTATCG | 257.24 | 152 | 0.591 | **-0.526** |
| LS | TTAAGC | 1102.11 | 551 | 0.500 | **-0.693** |
| LS | CTATCG | 237.85 | 102 | 0.429 | **-0.847** |
| LS | CTTAGC | 1889.55 | 793 | 0.420 | **-0.868** |
| LT | CTCACC | 2534.19 | 4959 | 1.957 | **0.671** |
| LT | CTCACG | 832.47 | 1510 | 1.814 | **0.595** |
| LT | TTAACA | 825.09 | 1163 | 1.410 | **0.343** |
| LT | CTCACT | 1814.22 | 2521 | 1.390 | **0.329** |
| LT | TTAACT | 729.65 | 969 | 1.328 | **0.284** |
| LT | CTAACT | 674.64 | 817 | 1.211 | **0.191** |
| LT | CTAACA | 762.89 | 898 | 1.177 | **0.163** |
| LT | CTCACA | 2051.52 | 2374 | 1.157 | **0.146** |
| LT | CTGACG | 1729.98 | 1795 | 1.038 | **0.037** |
| LT | TTGACT | 1225.76 | 1259 | 1.027 | **0.027** |
| LT | TTGACA | 1386.09 | 1401 | 1.011 | **0.011** |
| LT | CTTACT | 1250.98 | 1259 | 1.006 | **0.006** |
| LT | CTGACC | 5266.36 | 5160 | 0.980 | **-0.020** |
| LT | CTTACA | 1414.61 | 1109 | 0.784 | **-0.243** |
| LT | CTGACT | 3770.17 | 2808 | 0.745 | **-0.295** |
| LT | TTGACC | 1712.20 | 1235 | 0.721 | **-0.327** |
| LT | CTAACC | 942.38 | 678 | 0.719 | **-0.329** |
| LT | TTGACG | 562.45 | 399 | 0.709 | **-0.343** |
| LT | CTGACA | 4263.32 | 3003 | 0.704 | **-0.350** |
| LT | CTAACG | 309.57 | 215 | 0.695 | **-0.365** |
| LT | TTAACC | 1019.22 | 687 | 0.674 | **-0.394** |
| LT | CTTACC | 1747.43 | 1104 | 0.632 | **-0.459** |
| LT | TTAACG | 334.81 | 164 | 0.490 | **-0.714** |
| LT | CTTACG | 574.02 | 247 | 0.430 | **-0.843** |
| LV | CTTGTT | 1029.60 | 1741 | 1.691 | **0.525** |
| LV | TTAGTA | 389.95 | 602 | 1.544 | **0.434** |
| LV | TTGGTA | 655.07 | 980 | 1.496 | **0.403** |
| LV | CTTGTA | 668.56 | 993 | 1.485 | **0.396** |
| LV | CTGGTG | 7859.41 | 11424 | 1.454 | **0.374** |
| LV | CTAGTA | 360.55 | 519 | 1.439 | **0.364** |
| LV | TTGGTT | 1008.84 | 1427 | 1.414 | **0.347** |
| LV | CTTGTC | 1318.22 | 1541 | 1.169 | **0.156** |
| LV | TTAGTT | 600.53 | 690 | 1.149 | **0.139** |
| LV | CTGGTC | 3972.81 | 4541 | 1.143 | **0.134** |
| LV | TTGGTG | 2555.25 | 2882 | 1.128 | **0.120** |
| LV | CTAGTT | 555.26 | 580 | 1.045 | **0.044** |
| LV | TTGGTC | 1291.64 | 1345 | 1.041 | **0.040** |
| LV | CTTGTG | 2607.83 | 2540 | 0.974 | **-0.026** |
| LV | CTAGTG | 1406.38 | 1272 | 0.904 | **-0.100** |
| LV | CTGGTA | 2014.87 | 1720 | 0.854 | **-0.158** |
| LV | CTGGTT | 3102.98 | 2576 | 0.830 | **-0.186** |
| LV | CTAGTC | 710.90 | 551 | 0.775 | **-0.255** |
| LV | TTAGTG | 1521.06 | 947 | 0.623 | **-0.474** |
| LV | TTAGTC | 768.87 | 416 | 0.541 | **-0.614** |
| LV | CTCGTC | 1911.73 | 1013 | 0.530 | **-0.635** |

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| --- | --- | --- | --- | --- | --- |
| LV | CTCGTG | 3781.97 | 1691 | 0.447 | **-0.805** |
| LV | CTCGTT | 1493.16 | 373 | 0.250 | **-1.387** |
| LV | CTCGTA | 969.56 | 191 | 0.197 | **-1.625** |
| LW | CTCTGG | 1742.64 | 2796 | 1.604 | **0.473** |
| LW | CTGTGG | 3621.43 | 3365 | 0.929 | **-0.073** |
| LW | CTTTGG | 1201.63 | 1018 | 0.847 | **-0.166** |
| LW | CTATGG | 648.03 | 501 | 0.773 | **-0.257** |
| LW | TTATGG | 700.87 | 535 | 0.763 | **-0.270** |
| LW | TTGTGG | 1177.40 | 877 | 0.745 | **-0.295** |
| LY | CTCTAC | 2082.09 | 4204 | 2.019 | **0.703** |
| LY | TTATAT | 680.44 | 1022 | 1.502 | **0.407** |
| LY | CTCTAT | 1691.85 | 2487 | 1.470 | **0.385** |
| LY | CTTTAT | 1166.60 | 1591 | 1.364 | **0.310** |
| LY | CTATAT | 629.14 | 596 | 0.947 | **-0.054** |
| LY | TTGTAT | 1143.08 | 1063 | 0.930 | **-0.073** |
| LY | CTGTAC | 4326.84 | 3390 | 0.783 | **-0.244** |
| LY | CTTTAC | 1435.69 | 1069 | 0.745 | **-0.295** |
| LY | TTGTAC | 1406.74 | 1006 | 0.715 | **-0.335** |
| LY | TTATAC | 837.39 | 579 | 0.691 | **-0.369** |
| LY | CTGTAT | 3515.88 | 2202 | 0.626 | **-0.468** |
| LY | CTATAC | 774.26 | 481 | 0.621 | **-0.476** |
| MA | ATGGCG | 1645.46 | 2370 | 1.440 | **0.365** |
| MA | ATGGCA | 3503.58 | 3580 | 1.022 | **0.022** |
| MA | ATGGCT | 4002.27 | 4003 | 1.000 | **0.000** |
| MA | ATGGCC | 6085.70 | 5284 | 0.868 | **-0.141** |
| MC | ATGTGT | 1386.67 | 1448 | 1.044 | **0.043** |
| MC | ATGTGC | 1646.33 | 1585 | 0.963 | **-0.038** |
| MD | ATGGAT | 4467.48 | 4634 | 1.037 | **0.037** |
| MD | ATGGAC | 5046.52 | 4880 | 0.967 | **-0.034** |
| ME | ATGGAG | 8054.28 | 8223 | 1.021 | **0.021** |
| ME | ATGGAA | 6022.72 | 5854 | 0.972 | **-0.028** |
| MF | ATGTTT | 2565.53 | 2833 | 1.104 | **0.099** |
| MF | ATGTTC | 2936.47 | 2669 | 0.909 | **-0.096** |
| MG | ATGGGC | 3467.73 | 3533 | 1.019 | **0.019** |
| MG | ATGGGT | 1655.83 | 1675 | 1.012 | **0.012** |
| MG | ATGGGA | 2557.59 | 2526 | 0.988 | **-0.012** |
| MG | ATGGGG | 2496.85 | 2444 | 0.979 | **-0.021** |
| MH | ATGCAT | 1465.33 | 1478 | 1.009 | **0.009** |
| MH | ATGCAC | 2020.67 | 2008 | 0.994 | **-0.006** |
| MI | ATGATT | 2305.40 | 2382 | 1.033 | **0.033** |
| MI | ATGATA | 1060.28 | 1094 | 1.032 | **0.031** |
| MI | ATGATC | 2915.32 | 2805 | 0.962 | **-0.039** |
| MK | ATGAAG | 6107.32 | 6423 | 1.052 | **0.050** |
| MK | ATGAAA | 4715.68 | 4400 | 0.933 | **-0.069** |
| ML | ATGCTG | 5938.40 | 6536 | 1.101 | **0.096** |
| ML | ATGCTA | 1062.63 | 1122 | 1.056 | **0.054** |
| ML | ATGTTG | 1930.69 | 1922 | 0.995 | **-0.005** |
| ML | ATGTTA | 1149.28 | 1134 | 0.987 | **-0.013** |
| ML | ATGCTT | 1970.42 | 1887 | 0.958 | **-0.043** |
| ML | ATGCTC | 2857.58 | 2308 | 0.808 | **-0.214** |
| MM | ATGATG | 3925.00 | 3925 | 1.000 | **0.000** |
| MN | ATGAAT | 3249.30 | 3301 | 1.016 | **0.016** |
| MN | ATGAAC | 3578.70 | 3527 | 0.986 | **-0.015** |

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| --- | --- | --- | --- | --- | --- |
| MP | ATGCCC | 2676.16 | 2752 | 1.028 | **0.028** |
| MP | ATGCCA | 2313.29 | 2313 | 1.000 | **0.000** |
| MP | ATGCCT | 2396.87 | 2372 | 0.990 | **-0.010** |
| MP | ATGCCG | 969.67 | 919 | 0.948 | **-0.054** |
| MQ | ATGCAG | 5141.70 | 5165 | 1.005 | **0.005** |
| MQ | ATGCAA | 1841.30 | 1818 | 0.987 | **-0.013** |
| MR | ATGAGG | 1626.37 | 2127 | 1.308 | **0.268** |
| MR | ATGAGA | 1656.63 | 1974 | 1.192 | **0.175** |
| MR | ATGCGG | 1642.64 | 1513 | 0.921 | **-0.082** |
| MR | ATGCGT | 643.02 | 531 | 0.826 | **-0.191** |
| MR | ATGCGA | 890.44 | 684 | 0.768 | **-0.264** |
| MR | ATGCGC | 1501.91 | 1132 | 0.754 | **-0.283** |
| MS | ATGTCG | 666.33 | 809 | 1.214 | **0.194** |
| MS | ATGTCT | 2191.95 | 2338 | 1.067 | **0.065** |
| MS | ATGTCA | 1772.07 | 1781 | 1.005 | **0.005** |
| MS | ATGTCC | 2519.77 | 2493 | 0.989 | **-0.011** |
| MS | ATGAGT | 1801.10 | 1770 | 0.983 | **-0.017** |
| MS | ATGAGC | 2854.78 | 2615 | 0.916 | **-0.088** |
| MT | ATGACT | 2098.83 | 2195 | 1.046 | **0.045** |
| MT | ATGACC | 2931.75 | 2927 | 0.998 | **-0.002** |
| MT | ATGACA | 2373.36 | 2337 | 0.985 | **-0.015** |
| MT | ATGACG | 963.07 | 908 | 0.943 | **-0.059** |
| MV | ATGGTG | 4813.46 | 5122 | 1.064 | **0.062** |
| MV | ATGGTT | 1900.41 | 1915 | 1.008 | **0.008** |
| MV | ATGGTA | 1234.00 | 1191 | 0.965 | **-0.035** |
| MV | ATGGTC | 2433.13 | 2153 | 0.885 | **-0.122** |
| MW | ATGTGG | 1876.00 | 1876 | 1.000 | **0.000** |
| MY | ATGTAC | 2354.66 | 2363 | 1.004 | **0.004** |
| MY | ATGTAT | 1913.34 | 1905 | 0.996 | **-0.004** |
| NA | AATGCA | 1705.68 | 3344 | 1.961 | **0.673** |
| NA | AATGCT | 1948.47 | 3458 | 1.775 | **0.574** |
| NA | AATGCC | 2962.77 | 4259 | 1.438 | **0.363** |
| NA | AATGCG | 801.08 | 624 | 0.779 | **-0.250** |
| NA | AACGCG | 882.29 | 661 | 0.749 | **-0.289** |
| NA | AACGCC | 3263.12 | 1899 | 0.582 | **-0.541** |
| NA | AACGCA | 1878.60 | 700 | 0.373 | **-0.987** |
| NA | AACGCT | 2146.00 | 643 | 0.300 | **-1.205** |
| NC | AACTGC | 1868.57 | 2826 | 1.512 | **0.414** |
| NC | AACTGT | 1573.86 | 2016 | 1.281 | **0.248** |
| NC | AATTGT | 1429.00 | 935 | 0.654 | **-0.424** |
| NC | AATTGC | 1696.57 | 791 | 0.466 | **-0.763** |
| ND | AATGAT | 2555.01 | 4420 | 1.730 | **0.548** |
| ND | AATGAC | 2886.18 | 4521 | 1.566 | **0.449** |
| ND | AACGAC | 3178.77 | 1654 | 0.520 | **-0.653** |
| ND | AACGAT | 2814.03 | 839 | 0.298 | **-1.210** |
| NE | AATGAA | 3381.19 | 7367 | 2.179 | **0.779** |
| NE | AATGAG | 4521.72 | 5796 | 1.282 | **0.248** |
| NE | AACGAG | 4980.12 | 2476 | 0.497 | **-0.699** |
| NE | AACGAA | 3723.97 | 968 | 0.260 | **-1.347** |
| NF | AACTTC | 3150.86 | 4259 | 1.352 | **0.301** |
| NF | AACTTT | 2752.85 | 2846 | 1.034 | **0.033** |
| NF | AATTTT | 2499.46 | 2350 | 0.940 | **-0.062** |
| NF | AATTTC | 2860.84 | 1809 | 0.632 | **-0.458** |

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| --- | --- | --- | --- | --- | --- |
| NG | AATGGA | 2235.93 | 4484 | 2.005 | **0.696** |
| NG | AATGGT | 1447.59 | 2430 | 1.679 | **0.518** |
| NG | AATGGG | 2182.83 | 3202 | 1.467 | **0.383** |
| NG | AATGGC | 3031.62 | 4001 | 1.320 | **0.277** |
| NG | AACGGG | 2404.12 | 1508 | 0.627 | **-0.466** |
| NG | AACGGC | 3338.95 | 1752 | 0.525 | **-0.645** |
| NG | AACGGA | 2462.61 | 804 | 0.326 | **-1.119** |
| NG | AACGGT | 1594.34 | 517 | 0.324 | **-1.126** |
| NH | AACCAC | 2167.68 | 2776 | 1.281 | **0.247** |
| NH | AACCAT | 1571.93 | 1639 | 1.043 | **0.042** |
| NH | AATCAT | 1427.24 | 1456 | 1.020 | **0.020** |
| NH | AATCAC | 1968.15 | 1264 | 0.642 | **-0.443** |
| NI | AACATC | 3876.27 | 5487 | 1.416 | **0.348** |
| NI | AACATT | 3065.31 | 3184 | 1.039 | **0.038** |
| NI | AATATA | 1280.01 | 1309 | 1.023 | **0.022** |
| NI | AACATA | 1409.77 | 1384 | 0.982 | **-0.018** |
| NI | AATATT | 2783.16 | 2725 | 0.979 | **-0.021** |
| NI | AATATC | 3519.48 | 1845 | 0.524 | **-0.646** |
| NK | AACAAG | 4824.98 | 5918 | 1.227 | **0.204** |
| NK | AACAAA | 3725.54 | 4221 | 1.133 | **0.125** |
| NK | AATAAA | 3382.62 | 3607 | 1.066 | **0.064** |
| NK | AATAAG | 4380.86 | 2568 | 0.586 | **-0.534** |
| NL | AATTTA | 1025.31 | 1571 | 1.532 | **0.427** |
| NL | AACCTC | 2807.78 | 3954 | 1.408 | **0.342** |
| NL | AACTTG | 1897.05 | 2429 | 1.280 | **0.247** |
| NL | AACCTG | 5834.92 | 6690 | 1.147 | **0.137** |
| NL | AATTTG | 1722.43 | 1947 | 1.130 | **0.123** |
| NL | AATCTT | 1757.88 | 1943 | 1.105 | **0.100** |
| NL | AACCTA | 1044.12 | 1135 | 1.087 | **0.083** |
| NL | AACCTT | 1936.08 | 2021 | 1.044 | **0.043** |
| NL | AACTTA | 1129.25 | 1129 | 1.000 | **0.000** |
| NL | AATCTA | 948.01 | 893 | 0.942 | **-0.060** |
| NL | AATCTC | 2549.34 | 1713 | 0.672 | **-0.398** |
| NL | AATCTG | 5297.84 | 2525 | 0.477 | **-0.741** |
| NM | AACATG | 3351.76 | 4374 | 1.305 | **0.266** |
| NM | AATATG | 3043.24 | 2021 | 0.664 | **-0.409** |
| NN | AACAAC | 3150.02 | 4430 | 1.406 | **0.341** |
| NN | AACAAT | 2860.08 | 2830 | 0.989 | **-0.011** |
| NN | AATAAT | 2596.82 | 2424 | 0.933 | **-0.069** |
| NN | AATAAC | 2860.08 | 1783 | 0.623 | **-0.473** |
| NP | AACCCC | 2770.02 | 3474 | 1.254 | **0.226** |
| NP | AATCCA | 2174.02 | 2380 | 1.095 | **0.091** |
| NP | AACCCA | 2394.42 | 2612 | 1.091 | **0.087** |
| NP | AATCCT | 2252.58 | 2414 | 1.072 | **0.069** |
| NP | AACCCG | 1003.68 | 1048 | 1.044 | **0.043** |
| NP | AACCCT | 2480.94 | 2578 | 1.039 | **0.038** |
| NP | AATCCC | 2515.05 | 1641 | 0.652 | **-0.427** |
| NP | AATCCG | 911.29 | 355 | 0.390 | **-0.943** |
| NQ | AATCAA | 1516.57 | 1905 | 1.256 | **0.228** |
| NQ | AACCAA | 1670.31 | 1955 | 1.170 | **0.157** |
| NQ | AACCAG | 4664.22 | 5409 | 1.160 | **0.148** |
| NQ | AATCAG | 4234.90 | 2817 | 0.665 | **-0.408** |
| NR | AACAGA | 1511.98 | 2383 | 1.576 | **0.455** |

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| --- | --- | --- | --- | --- | --- |
| NR | AACCGC | 1370.77 | 1966 | 1.434 | **0.361** |
| NR | AACAGG | 1484.36 | 1903 | 1.282 | **0.248** |
| NR | AACCGA | 812.69 | 998 | 1.228 | **0.205** |
| NR | AACCGT | 586.88 | 706 | 1.203 | **0.185** |
| NR | AACCGG | 1499.21 | 1779 | 1.187 | **0.171** |
| NR | AATCGA | 737.89 | 687 | 0.931 | **-0.071** |
| NR | AATCGT | 532.86 | 486 | 0.912 | **-0.092** |
| NR | AATAGA | 1372.81 | 1117 | 0.814 | **-0.206** |
| NR | AATCGC | 1244.60 | 602 | 0.484 | **-0.726** |
| NR | AATAGG | 1347.73 | 643 | 0.477 | **-0.740** |
| NR | AATCGG | 1361.22 | 593 | 0.436 | **-0.831** |
| NS | AACAGC | 2917.73 | 4490 | 1.539 | **0.431** |
| NS | AACAGT | 1840.81 | 2414 | 1.311 | **0.271** |
| NS | AACTCG | 681.02 | 821 | 1.206 | **0.187** |
| NS | AATTCA | 1644.43 | 1970 | 1.198 | **0.181** |
| NS | AATTCT | 2034.08 | 2383 | 1.172 | **0.158** |
| NS | AACTCC | 2575.33 | 2818 | 1.094 | **0.090** |
| NS | AACTCA | 1811.14 | 1783 | 0.984 | **-0.016** |
| NS | AACTCT | 2240.29 | 1981 | 0.884 | **-0.123** |
| NS | AATAGT | 1671.38 | 1193 | 0.714 | **-0.337** |
| NS | AATTCC | 2338.29 | 1655 | 0.708 | **-0.346** |
| NS | AATAGC | 2649.17 | 1273 | 0.481 | **-0.733** |
| NS | AATTCG | 618.33 | 241 | 0.390 | **-0.942** |
| NT | AACACG | 860.22 | 1238 | 1.439 | **0.364** |
| NT | AACACA | 2119.90 | 2783 | 1.313 | **0.272** |
| NT | AACACC | 2618.65 | 3278 | 1.252 | **0.225** |
| NT | AACACT | 1874.68 | 2099 | 1.120 | **0.113** |
| NT | AATACT | 1702.13 | 1540 | 0.905 | **-0.100** |
| NT | AATACA | 1924.77 | 1692 | 0.879 | **-0.129** |
| NT | AATACC | 2377.62 | 1312 | 0.552 | **-0.595** |
| NT | AATACG | 781.04 | 317 | 0.406 | **-0.902** |
| NV | AATGTA | 927.15 | 1710 | 1.844 | **0.612** |
| NV | AATGTT | 1427.85 | 2573 | 1.802 | **0.589** |
| NV | AATGTC | 1828.10 | 2877 | 1.574 | **0.453** |
| NV | AATGTG | 3616.54 | 4314 | 1.193 | **0.176** |
| NV | AACGTG | 3983.18 | 2772 | 0.696 | **-0.363** |
| NV | AACGTC | 2013.43 | 1341 | 0.666 | **-0.406** |
| NV | AACGTT | 1572.60 | 509 | 0.324 | **-1.128** |
| NV | AACGTA | 1021.14 | 294 | 0.288 | **-1.245** |
| NW | AACTGG | 1808.22 | 2595 | 1.435 | **0.361** |
| NW | AATTGG | 1641.78 | 855 | 0.521 | **-0.652** |
| NY | AACTAC | 2506.72 | 3191 | 1.273 | **0.241** |
| NY | AACTAT | 2036.89 | 2145 | 1.053 | **0.052** |
| NY | AATTAT | 1849.41 | 1795 | 0.971 | **-0.030** |
| NY | AATTAC | 2275.98 | 1538 | 0.676 | **-0.392** |
| PA | CCGGCG | 470.57 | 1166 | 2.478 | **0.907** |
| PA | CCGGCC | 1740.39 | 2666 | 1.532 | **0.426** |
| PA | CCAGCA | 2390.31 | 3368 | 1.409 | **0.343** |
| PA | CCAGCT | 2730.54 | 3622 | 1.326 | **0.283** |
| PA | CCTGCT | 2829.20 | 3750 | 1.325 | **0.282** |
| PA | CCTGCA | 2476.67 | 3178 | 1.283 | **0.249** |
| PA | CCAGCC | 4151.96 | 4942 | 1.190 | **0.174** |
| PA | CCCGCG | 1298.71 | 1528 | 1.177 | **0.163** |

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| PA | CCTGCC | 4301.98 | 5000 | 1.162 | **0.150** |
| PA | CCAGCG | 1122.61 | 1078 | 0.960 | **-0.041** |
| PA | CCTGCG | 1163.17 | 1105 | 0.950 | **-0.051** |
| PA | CCGGCT | 1144.57 | 1013 | 0.885 | **-0.122** |
| PA | CCGGCA | 1001.95 | 777 | 0.775 | **-0.254** |
| PA | CCCGCC | 4803.25 | 2690 | 0.560 | **-0.580** |
| PA | CCCGCA | 2765.26 | 846 | 0.306 | **-1.184** |
| PA | CCCGCT | 3158.86 | 821 | 0.260 | **-1.347** |
| PC | CCCTGC | 1550.51 | 2870 | 1.851 | **0.616** |
| PC | CCCTGT | 1305.97 | 1577 | 1.208 | **0.189** |
| PC | CCGTGC | 561.80 | 630 | 1.121 | **0.115** |
| PC | CCTTGT | 1169.67 | 1001 | 0.856 | **-0.156** |
| PC | CCATGT | 1128.89 | 831 | 0.736 | **-0.306** |
| PC | CCGTGT | 473.20 | 340 | 0.719 | **-0.331** |
| PC | CCTTGC | 1388.69 | 937 | 0.675 | **-0.393** |
| PC | CCATGC | 1340.27 | 733 | 0.547 | **-0.603** |
| PD | CCAGAT | 2721.60 | 4165 | 1.530 | **0.425** |
| PD | CCTGAT | 2819.94 | 3781 | 1.341 | **0.293** |
| PD | CCGGAC | 1288.69 | 1659 | 1.287 | **0.253** |
| PD | CCAGAC | 3074.36 | 3766 | 1.225 | **0.203** |
| PD | CCTGAC | 3185.44 | 3646 | 1.145 | **0.135** |
| PD | CCGGAT | 1140.82 | 895 | 0.785 | **-0.243** |
| PD | CCCGAC | 3556.62 | 2215 | 0.623 | **-0.474** |
| PD | CCCGAT | 3148.53 | 809 | 0.257 | **-1.359** |
| PE | CCAGAA | 3999.86 | 5699 | 1.425 | **0.354** |
| PE | CCTGAG | 5542.36 | 7122 | 1.285 | **0.251** |
| PE | CCGGAG | 2242.20 | 2870 | 1.280 | **0.247** |
| PE | CCAGAG | 5349.08 | 6777 | 1.267 | **0.237** |
| PE | CCTGAA | 4144.39 | 5108 | 1.233 | **0.209** |
| PE | CCCGAG | 6188.17 | 4149 | 0.670 | **-0.400** |
| PE | CCGGAA | 1676.64 | 1032 | 0.616 | **-0.485** |
| PE | CCCGAA | 4627.30 | 1013 | 0.219 | **-1.519** |
| PF | CCCTTC | 2555.92 | 4301 | 1.683 | **0.520** |
| PF | CCATTT | 1930.27 | 2057 | 1.066 | **0.064** |
| PF | CCTTTT | 2000.01 | 1967 | 0.983 | **-0.017** |
| PF | CCCTTT | 2233.06 | 2159 | 0.967 | **-0.034** |
| PF | CCTTTC | 2289.18 | 2078 | 0.908 | **-0.097** |
| PF | CCGTTC | 926.10 | 662 | 0.715 | **-0.336** |
| PF | CCATTC | 2209.35 | 1290 | 0.584 | **-0.538** |
| PF | CCGTTT | 809.12 | 439 | 0.543 | **-0.611** |
| PG | CCTGGG | 2918.52 | 4310 | 1.477 | **0.390** |
| PG | CCTGGA | 2989.52 | 4317 | 1.444 | **0.367** |
| PG | CCGGGC | 1639.82 | 2353 | 1.435 | **0.361** |
| PG | CCGGGG | 1180.71 | 1657 | 1.403 | **0.339** |
| PG | CCTGGT | 1935.48 | 2673 | 1.381 | **0.323** |
| PG | CCAGGA | 2885.27 | 3897 | 1.351 | **0.301** |
| PG | CCAGGG | 2816.75 | 3472 | 1.233 | **0.209** |
| PG | CCAGGT | 1867.98 | 2259 | 1.209 | **0.190** |
| PG | CCTGGC | 4053.37 | 4622 | 1.140 | **0.131** |
| PG | CCAGGC | 3912.02 | 4106 | 1.050 | **0.048** |
| PG | CCGGGT | 783.01 | 661 | 0.844 | **-0.169** |
| PG | CCGGGA | 1209.43 | 963 | 0.796 | **-0.228** |
| PG | CCCGGG | 3258.60 | 2136 | 0.655 | **-0.422** |

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| PG | CCCGGC | 4525.68 | 2555 | 0.565 | **-0.572** |
| PG | CCCGGA | 3337.86 | 968 | 0.290 | **-1.238** |
| PG | CCCGGT | 2161.00 | 526 | 0.243 | **-1.413** |
| PH | CCGCAC | 725.13 | 972 | 1.340 | **0.293** |
| PH | CCCCAC | 2001.25 | 2505 | 1.252 | **0.225** |
| PH | CCTCAT | 1299.79 | 1592 | 1.225 | **0.203** |
| PH | CCACAT | 1254.46 | 1222 | 0.974 | **-0.026** |
| PH | CCCCAT | 1451.24 | 1303 | 0.898 | **-0.108** |
| PH | CCTCAC | 1792.40 | 1531 | 0.854 | **-0.158** |
| PH | CCACAC | 1729.89 | 1366 | 0.790 | **-0.236** |
| PH | CCGCAT | 525.84 | 289 | 0.550 | **-0.599** |
| PI | CCCATC | 2119.04 | 4651 | 2.195 | **0.786** |
| PI | CCCATT | 1675.71 | 2102 | 1.254 | **0.227** |
| PI | CCAATA | 666.18 | 819 | 1.229 | **0.207** |
| PI | CCCATA | 770.68 | 776 | 1.007 | **0.007** |
| PI | CCAATT | 1448.49 | 1386 | 0.957 | **-0.044** |
| PI | CCTATA | 690.25 | 603 | 0.874 | **-0.135** |
| PI | CCTATT | 1500.83 | 1266 | 0.844 | **-0.170** |
| PI | CCAATC | 1831.71 | 939 | 0.513 | **-0.668** |
| PI | CCTATC | 1897.89 | 957 | 0.504 | **-0.685** |
| PI | CCGATT | 607.17 | 299 | 0.492 | **-0.708** |
| PI | CCGATC | 767.80 | 342 | 0.445 | **-0.809** |
| PI | CCGATA | 279.24 | 115 | 0.412 | **-0.887** |
| PK | CCCAAG | 3738.47 | 6383 | 1.707 | **0.535** |
| PK | CCCAAA | 2886.60 | 3787 | 1.312 | **0.271** |
| PK | CCAAAA | 2495.20 | 2489 | 0.998 | **-0.002** |
| PK | CCAAAG | 3231.55 | 3127 | 0.968 | **-0.033** |
| PK | CCTAAA | 2585.35 | 1840 | 0.712 | **-0.340** |
| PK | CCGAAG | 1354.58 | 940 | 0.694 | **-0.365** |
| PK | CCTAAG | 3348.32 | 1660 | 0.496 | **-0.702** |
| PK | CCGAAA | 1045.92 | 460 | 0.440 | **-0.821** |
| PL | CCGCTG | 1824.84 | 3343 | 1.832 | **0.605** |
| PL | CCGCTC | 878.12 | 1254 | 1.428 | **0.356** |
| PL | CCTTTG | 1466.52 | 2054 | 1.401 | **0.337** |
| PL | CCTTTA | 872.97 | 1195 | 1.369 | **0.314** |
| PL | CCCTTG | 1637.40 | 2122 | 1.296 | **0.259** |
| PL | CCTCTT | 1496.70 | 1827 | 1.221 | **0.199** |
| PL | CCCCTG | 5036.31 | 5760 | 1.144 | **0.134** |
| PL | CCCCTC | 2423.49 | 2646 | 1.092 | **0.088** |
| PL | CCTCTA | 807.16 | 871 | 1.079 | **0.076** |
| PL | CCATTA | 842.53 | 826 | 0.980 | **-0.020** |
| PL | CCACTT | 1444.51 | 1371 | 0.949 | **-0.052** |
| PL | CCACTA | 779.01 | 729 | 0.936 | **-0.066** |
| PL | CCTCTC | 2170.57 | 1934 | 0.891 | **-0.115** |
| PL | CCTCTG | 4510.71 | 3745 | 0.830 | **-0.186** |
| PL | CCATTG | 1415.38 | 1172 | 0.828 | **-0.189** |
| PL | CCCCTT | 1671.10 | 1324 | 0.792 | **-0.233** |
| PL | CCGCTA | 326.54 | 255 | 0.781 | **-0.247** |
| PL | CCCCTA | 901.21 | 689 | 0.765 | **-0.268** |
| PL | CCACTG | 4353.41 | 3218 | 0.739 | **-0.302** |
| PL | CCCTTA | 974.69 | 709 | 0.727 | **-0.318** |
| PL | CCACTC | 2094.88 | 1475 | 0.704 | **-0.351** |
| PL | CCGTTG | 593.29 | 402 | 0.678 | **-0.389** |

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| PL | CCGCTT | 605.50 | 402 | 0.664 | **-0.410** |
| PL | CCGTTA | 353.17 | 157 | 0.445 | **-0.811** |
| PM | CCCATG | 2307.54 | 3923 | 1.700 | **0.531** |
| PM | CCAATG | 1994.65 | 1552 | 0.778 | **-0.251** |
| PM | CCGATG | 836.10 | 520 | 0.622 | **-0.475** |
| PM | CCTATG | 2066.72 | 1210 | 0.585 | **-0.535** |
| PN | CCCAAC | 2313.61 | 4255 | 1.839 | **0.609** |
| PN | CCAAAT | 1815.81 | 2453 | 1.351 | **0.301** |
| PN | CCCAAT | 2100.65 | 2296 | 1.093 | **0.089** |
| PN | CCAAAC | 1999.90 | 1735 | 0.868 | **-0.142** |
| PN | CCTAAT | 1881.42 | 1342 | 0.713 | **-0.338** |
| PN | CCTAAC | 2072.16 | 997 | 0.481 | **-0.732** |
| PN | CCGAAT | 761.14 | 340 | 0.447 | **-0.806** |
| PN | CCGAAC | 838.30 | 365 | 0.435 | **-0.831** |
| PP | CCGCCG | 608.57 | 2335 | 3.837 | **1.345** |
| PP | CCGCCC | 1679.58 | 2697 | 1.606 | **0.474** |
| PP | CCCCCG | 1679.58 | 2420 | 1.441 | **0.365** |
| PP | CCTCCA | 3588.72 | 4314 | 1.202 | **0.184** |
| PP | CCTCCT | 3718.39 | 4305 | 1.158 | **0.146** |
| PP | CCACCA | 3463.58 | 3850 | 1.112 | **0.106** |
| PP | CCACCT | 3588.72 | 3798 | 1.058 | **0.057** |
| PP | CCCCCA | 4006.89 | 4095 | 1.022 | **0.022** |
| PP | CCACCC | 4006.89 | 3595 | 0.897 | **-0.108** |
| PP | CCGCCA | 1451.84 | 1280 | 0.882 | **-0.126** |
| PP | CCACCG | 1451.84 | 1252 | 0.862 | **-0.148** |
| PP | CCGCCT | 1504.30 | 1286 | 0.855 | **-0.157** |
| PP | CCTCCC | 4151.67 | 3338 | 0.804 | **-0.218** |
| PP | CCTCCG | 1504.30 | 1152 | 0.766 | **-0.267** |
| PP | CCCCCT | 4151.67 | 3160 | 0.761 | **-0.273** |
| PP | CCCCCC | 4635.43 | 2315 | 0.499 | **-0.694** |
| PQ | CCCCAG | 5063.98 | 6421 | 1.268 | **0.237** |
| PQ | CCGCAG | 1834.86 | 2187 | 1.192 | **0.176** |
| PQ | CCTCAA | 1624.21 | 1752 | 1.079 | **0.076** |
| PQ | CCTCAG | 4535.49 | 4221 | 0.931 | **-0.072** |
| PQ | CCACAA | 1567.57 | 1405 | 0.896 | **-0.109** |
| PQ | CCACAG | 4377.33 | 3670 | 0.838 | **-0.176** |
| PQ | CCCCAA | 1813.47 | 1497 | 0.825 | **-0.192** |
| PQ | CCGCAA | 657.08 | 321 | 0.489 | **-0.716** |
| PR | CCGCGC | 563.43 | 1094 | 1.942 | **0.664** |
| PR | CCGCGG | 616.23 | 1113 | 1.806 | **0.591** |
| PR | CCCAGG | 1683.86 | 2927 | 1.738 | **0.553** |
| PR | CCCCGG | 1700.71 | 2608 | 1.533 | **0.428** |
| PR | CCCCGC | 1555.00 | 1979 | 1.273 | **0.241** |
| PR | CCCCGA | 921.92 | 1166 | 1.265 | **0.235** |
| PR | CCTCGA | 825.71 | 1015 | 1.229 | **0.206** |
| PR | CCAAGA | 1482.62 | 1608 | 1.085 | **0.081** |
| PR | CCTCGT | 596.27 | 644 | 1.080 | **0.077** |
| PR | CCCAGA | 1715.19 | 1801 | 1.050 | **0.049** |
| PR | CCGAGG | 610.12 | 636 | 1.042 | **0.042** |
| PR | CCTCGG | 1523.22 | 1511 | 0.992 | **-0.008** |
| PR | CCCCGT | 665.75 | 655 | 0.984 | **-0.016** |
| PR | CCAAGG | 1455.54 | 1347 | 0.925 | **-0.077** |
| PR | CCACGA | 796.91 | 632 | 0.793 | **-0.232** |

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| PR | CCGCGT | 241.23 | 191 | 0.792 | **-0.233** |
| PR | CCACGT | 575.48 | 418 | 0.726 | **-0.320** |
| PR | CCACGG | 1470.10 | 1040 | 0.707 | **-0.346** |
| PR | CCGCGA | 334.04 | 226 | 0.677 | **-0.391** |
| PR | CCTCGC | 1392.72 | 838 | 0.602 | **-0.508** |
| PR | CCACGC | 1344.15 | 701 | 0.522 | **-0.651** |
| PR | CCGAGA | 621.48 | 308 | 0.496 | **-0.702** |
| PR | CCTAGA | 1536.19 | 692 | 0.450 | **-0.797** |
| PR | CCTAGG | 1508.13 | 586 | 0.389 | **-0.945** |
| PS | CCCAGC | 3196.25 | 6398 | 2.002 | **0.694** |
| PS | CCCTCG | 746.03 | 1385 | 1.856 | **0.619** |
| PS | CCGTCG | 270.31 | 483 | 1.787 | **0.580** |
| PS | CCCAGT | 2016.53 | 2743 | 1.360 | **0.308** |
| PS | CCTTCA | 1776.97 | 2263 | 1.274 | **0.242** |
| PS | CCTTCT | 2198.02 | 2711 | 1.233 | **0.210** |
| PS | CCCTCC | 2821.16 | 3353 | 1.189 | **0.173** |
| PS | CCATCA | 1715.00 | 1819 | 1.061 | **0.059** |
| PS | CCATCT | 2121.37 | 2183 | 1.029 | **0.029** |
| PS | CCTTCC | 2526.74 | 2594 | 1.027 | **0.026** |
| PS | CCGTCC | 1022.21 | 1048 | 1.025 | **0.025** |
| PS | CCCTCA | 1984.02 | 1945 | 0.980 | **-0.020** |
| PS | CCAAGT | 1743.10 | 1582 | 0.908 | **-0.097** |
| PS | CCCTCT | 2454.14 | 2113 | 0.861 | **-0.150** |
| PS | CCTTCG | 668.17 | 552 | 0.826 | **-0.191** |
| PS | CCATCC | 2438.63 | 1995 | 0.818 | **-0.201** |
| PS | CCGAGC | 1158.11 | 885 | 0.764 | **-0.269** |
| PS | CCATCG | 644.87 | 475 | 0.737 | **-0.306** |
| PS | CCAAGC | 2762.85 | 1659 | 0.600 | **-0.510** |
| PS | CCGTCT | 889.22 | 523 | 0.588 | **-0.531** |
| PS | CCGAGT | 730.66 | 371 | 0.508 | **-0.678** |
| PS | CCGTCA | 718.88 | 364 | 0.506 | **-0.681** |
| PS | CCTAGT | 1806.08 | 860 | 0.476 | **-0.742** |
| PS | CCTAGC | 2862.68 | 968 | 0.338 | **-1.084** |
| PT | CCCACG | 829.55 | 1764 | 2.126 | **0.754** |
| PT | CCCACC | 2525.29 | 4586 | 1.816 | **0.597** |
| PT | CCCACA | 2044.32 | 2719 | 1.330 | **0.285** |
| PT | CCCACT | 1807.85 | 2282 | 1.262 | **0.233** |
| PT | CCAACA | 1767.12 | 1895 | 1.072 | **0.070** |
| PT | CCAACT | 1562.71 | 1593 | 1.019 | **0.019** |
| PT | CCGACG | 300.57 | 305 | 1.015 | **0.015** |
| PT | CCTACT | 1619.18 | 1252 | 0.773 | **-0.257** |
| PT | CCAACC | 2182.87 | 1514 | 0.694 | **-0.366** |
| PT | CCTACA | 1830.97 | 1241 | 0.678 | **-0.389** |
| PT | CCGACC | 915.00 | 592 | 0.647 | **-0.435** |
| PT | CCAACG | 717.06 | 463 | 0.646 | **-0.437** |
| PT | CCTACC | 2261.75 | 1251 | 0.553 | **-0.592** |
| PT | CCGACT | 655.05 | 342 | 0.522 | **-0.650** |
| PT | CCGACA | 740.73 | 352 | 0.475 | **-0.744** |
| PT | CCTACG | 742.97 | 352 | 0.474 | **-0.747** |
| PV | CCTGTT | 1493.79 | 2375 | 1.590 | **0.464** |
| PV | CCTGTA | 969.97 | 1482 | 1.528 | **0.424** |
| PV | CCAGTA | 936.15 | 1352 | 1.444 | **0.368** |
| PV | CCTGTG | 3783.57 | 5362 | 1.417 | **0.349** |

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| --- | --- | --- | --- | --- | --- |
| PV | CCAGTT | 1441.70 | 2038 | 1.414 | **0.346** |
| PV | CCTGTC | 1912.53 | 2666 | 1.394 | **0.332** |
| PV | CCGGTG | 1530.67 | 1911 | 1.248 | **0.222** |
| PV | CCAGTG | 3651.63 | 3787 | 1.037 | **0.036** |
| PV | CCAGTC | 1845.84 | 1863 | 1.009 | **0.009** |
| PV | CCGGTC | 773.73 | 778 | 1.006 | **0.006** |
| PV | CCCGTG | 4224.44 | 2576 | 0.610 | **-0.495** |
| PV | CCGGTT | 604.32 | 351 | 0.581 | **-0.543** |
| PV | CCGGTA | 392.41 | 215 | 0.548 | **-0.602** |
| PV | CCCGTC | 2135.39 | 1084 | 0.508 | **-0.678** |
| PV | CCCGTT | 1667.85 | 391 | 0.234 | **-1.451** |
| PV | CCCGTA | 1083.00 | 216 | 0.199 | **-1.612** |
| PW | CCCTGG | 1769.80 | 2753 | 1.556 | **0.442** |
| PW | CCGTGG | 641.26 | 661 | 1.031 | **0.030** |
| PW | CCATGG | 1529.83 | 1060 | 0.693 | **-0.367** |
| PW | CCTTGG | 1585.10 | 1052 | 0.664 | **-0.410** |
| PY | CCCTAC | 2166.25 | 3378 | 1.559 | **0.444** |
| PY | CCCTAT | 1760.24 | 2097 | 1.191 | **0.175** |
| PY | CCTTAT | 1576.54 | 1702 | 1.080 | **0.077** |
| PY | CCATAT | 1521.56 | 1513 | 0.994 | **-0.006** |
| PY | CCTTAC | 1940.18 | 1485 | 0.765 | **-0.267** |
| PY | CCGTAC | 784.91 | 592 | 0.754 | **-0.282** |
| PY | CCGTAT | 637.80 | 429 | 0.673 | **-0.397** |
| PY | CCATAC | 1872.52 | 1064 | 0.568 | **-0.565** |
| QA | CAAGCA | 1597.87 | 2339 | 1.464 | **0.381** |
| QA | CAAGCT | 1825.31 | 2409 | 1.320 | **0.277** |
| QA | CAGGCG | 2095.55 | 2271 | 1.084 | **0.080** |
| QA | CAGGCC | 7750.37 | 7695 | 0.993 | **-0.007** |
| QA | CAAGCC | 2775.49 | 2655 | 0.957 | **-0.044** |
| QA | CAGGCT | 5097.04 | 4584 | 0.899 | **-0.106** |
| QA | CAGGCA | 4461.94 | 3943 | 0.884 | **-0.124** |
| QA | CAAGCG | 750.44 | 458 | 0.610 | **-0.494** |
| QC | CAGTGT | 2490.13 | 2791 | 1.121 | **0.114** |
| QC | CAGTGC | 2956.40 | 3260 | 1.103 | **0.098** |
| QC | CAATGT | 891.74 | 822 | 0.922 | **-0.081** |
| QC | CAATGC | 1058.72 | 524 | 0.495 | **-0.703** |
| QD | CAAGAT | 2128.42 | 3326 | 1.563 | **0.446** |
| QD | CAAGAC | 2404.29 | 2506 | 1.042 | **0.041** |
| QD | CAGGAC | 6713.82 | 6642 | 0.989 | **-0.011** |
| QD | CAGGAT | 5943.46 | 4716 | 0.793 | **-0.231** |
| QE | CAAGAA | 3247.03 | 5286 | 1.628 | **0.487** |
| QE | CAGGAG | 12125.58 | 12556 | 1.035 | **0.035** |
| QE | CAAGAG | 4342.30 | 4206 | 0.969 | **-0.032** |
| QE | CAGGAA | 9067.09 | 6734 | 0.743 | **-0.297** |
| QF | CAGTTT | 3509.26 | 4032 | 1.149 | **0.139** |
| QF | CAGTTC | 4016.64 | 4205 | 1.047 | **0.046** |
| QF | CAATTT | 1256.70 | 1156 | 0.920 | **-0.084** |
| QF | CAATTC | 1438.40 | 828 | 0.576 | **-0.552** |
| QG | CAAGGA | 1440.03 | 2837 | 1.970 | **0.678** |
| QG | CAAGGT | 932.30 | 1506 | 1.615 | **0.480** |
| QG | CAAGGG | 1405.83 | 1700 | 1.209 | **0.190** |
| QG | CAAGGC | 1952.47 | 2192 | 1.123 | **0.116** |
| QG | CAGGGC | 5452.14 | 5605 | 1.028 | **0.028** |

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| --- | --- | --- | --- | --- | --- |
| QG | CAGGGT | 2603.39 | 2292 | 0.880 | **-0.127** |
| QG | CAGGGA | 4021.17 | 2871 | 0.714 | **-0.337** |
| QG | CAGGGG | 3925.67 | 2730 | 0.695 | **-0.363** |
| QH | CAACAT | 1067.82 | 1364 | 1.277 | **0.245** |
| QH | CAGCAC | 4111.88 | 4483 | 1.090 | **0.086** |
| QH | CAGCAT | 2981.80 | 2794 | 0.937 | **-0.065** |
| QH | CAACAC | 1472.51 | 993 | 0.674 | **-0.394** |
| QI | CAAATA | 656.37 | 1125 | 1.714 | **0.539** |
| QI | CAAATT | 1427.17 | 1667 | 1.168 | **0.155** |
| QI | CAGATC | 5039.60 | 5197 | 1.031 | **0.031** |
| QI | CAGATA | 1832.87 | 1802 | 0.983 | **-0.017** |
| QI | CAGATT | 3985.26 | 3693 | 0.927 | **-0.076** |
| QI | CAAATC | 1804.74 | 1262 | 0.699 | **-0.358** |
| QK | CAGAAG | 8990.94 | 9726 | 1.082 | **0.079** |
| QK | CAAAAA | 2486.09 | 2610 | 1.050 | **0.049** |
| QK | CAGAAA | 6942.22 | 6532 | 0.941 | **-0.061** |
| QK | CAAAAG | 3219.76 | 2771 | 0.861 | **-0.150** |
| QL | CAGCTG | 10304.18 | 12629 | 1.226 | **0.203** |
| QL | CAACTA | 660.31 | 798 | 1.209 | **0.189** |
| QL | CAACTT | 1224.39 | 1479 | 1.208 | **0.189** |
| QL | CAGCTC | 4958.40 | 5986 | 1.207 | **0.188** |
| QL | CAGCTA | 1843.86 | 2002 | 1.086 | **0.082** |
| QL | CAGCTT | 3419.03 | 3476 | 1.017 | **0.017** |
| QL | CAATTA | 714.15 | 642 | 0.899 | **-0.107** |
| QL | CAGTTG | 3350.09 | 2597 | 0.775 | **-0.255** |
| QL | CAGTTA | 1994.20 | 1518 | 0.761 | **-0.273** |
| QL | CAACTC | 1775.66 | 1279 | 0.720 | **-0.328** |
| QL | CAACTG | 3690.04 | 2093 | 0.567 | **-0.567** |
| QL | CAATTG | 1199.70 | 635 | 0.529 | **-0.636** |
| QM | CAGATG | 5587.91 | 5592 | 1.001 | **0.001** |
| QM | CAAATG | 2001.09 | 1997 | 0.998 | **-0.002** |
| QN | CAAAAT | 1720.47 | 2394 | 1.391 | **0.330** |
| QN | CAGAAC | 5291.34 | 5195 | 0.982 | **-0.018** |
| QN | CAGAAT | 4804.30 | 4430 | 0.922 | **-0.081** |
| QN | CAAAAC | 1894.89 | 1692 | 0.893 | **-0.113** |
| QP | CAGCCG | 1816.66 | 2237 | 1.231 | **0.208** |
| QP | CAGCCC | 5013.75 | 6143 | 1.225 | **0.203** |
| QP | CAGCCT | 4490.51 | 4526 | 1.008 | **0.008** |
| QP | CAGCCA | 4333.91 | 4235 | 0.977 | **-0.023** |
| QP | CAACCA | 1552.02 | 1441 | 0.928 | **-0.074** |
| QP | CAACCT | 1608.10 | 1304 | 0.811 | **-0.210** |
| QP | CAACCC | 1795.48 | 1132 | 0.630 | **-0.461** |
| QP | CAACCG | 650.57 | 243 | 0.374 | **-0.985** |
| QQ | CAACAA | 1545.49 | 1866 | 1.207 | **0.188** |
| QQ | CAGCAG | 12051.19 | 13131 | 1.090 | **0.086** |
| QQ | CAGCAA | 4315.66 | 4034 | 0.935 | **-0.067** |
| QQ | CAACAG | 4315.66 | 3197 | 0.741 | **-0.300** |
| QR | CAAAGA | 1214.45 | 1863 | 1.534 | **0.428** |
| QR | CAGAGG | 3329.32 | 4331 | 1.301 | **0.263** |
| QR | CAAAGG | 1192.27 | 1360 | 1.141 | **0.132** |
| QR | CAGAGA | 3391.27 | 3777 | 1.114 | **0.108** |
| QR | CAGCGC | 3074.54 | 3169 | 1.031 | **0.030** |
| QR | CAGCGG | 3362.63 | 3352 | 0.997 | **-0.003** |

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| --- | --- | --- | --- | --- | --- |
| QR | CAGCGT | 1316.32 | 1215 | 0.923 | **-0.080** |
| QR | CAGCGA | 1822.82 | 1469 | 0.806 | **-0.216** |
| QR | CAACGT | 471.39 | 327 | 0.694 | **-0.366** |
| QR | CAACGA | 652.77 | 413 | 0.633 | **-0.458** |
| QR | CAACGG | 1204.20 | 453 | 0.376 | **-0.978** |
| QR | CAACGC | 1101.03 | 404 | 0.367 | **-1.003** |
| QS | CAAAGT | 904.91 | 1408 | 1.556 | **0.442** |
| QS | CAGAGC | 4005.17 | 5248 | 1.310 | **0.270** |
| QS | CAGAGT | 2526.89 | 2963 | 1.173 | **0.159** |
| QS | CAAAGC | 1434.30 | 1465 | 1.021 | **0.021** |
| QS | CAGTCG | 934.84 | 923 | 0.987 | **-0.013** |
| QS | CAGTCA | 2486.15 | 2379 | 0.957 | **-0.044** |
| QS | CAGTCT | 3075.24 | 2806 | 0.912 | **-0.092** |
| QS | CAATCA | 890.32 | 781 | 0.877 | **-0.131** |
| QS | CAGTCC | 3535.16 | 3051 | 0.863 | **-0.147** |
| QS | CAATCT | 1101.28 | 765 | 0.695 | **-0.364** |
| QS | CAATCC | 1265.98 | 587 | 0.464 | **-0.769** |
| QS | CAATCG | 334.78 | 119 | 0.355 | **-1.034** |
| QT | CAAACT | 1116.05 | 1463 | 1.311 | **0.271** |
| QT | CAAACA | 1262.03 | 1602 | 1.269 | **0.239** |
| QT | CAGACG | 1430.02 | 1665 | 1.164 | **0.152** |
| QT | CAGACC | 4353.25 | 4301 | 0.988 | **-0.012** |
| QT | CAGACA | 3524.12 | 3445 | 0.978 | **-0.023** |
| QT | CAGACT | 3116.48 | 2792 | 0.896 | **-0.110** |
| QT | CAAACC | 1558.95 | 1232 | 0.790 | **-0.235** |
| QT | CAAACG | 512.11 | 373 | 0.728 | **-0.317** |
| QV | CAAGTA | 657.01 | 1210 | 1.842 | **0.611** |
| QV | CAAGTT | 1011.82 | 1737 | 1.717 | **0.540** |
| QV | CAAGTC | 1295.45 | 1468 | 1.133 | **0.125** |
| QV | CAAGTG | 2562.79 | 2712 | 1.058 | **0.057** |
| QV | CAGGTG | 7156.41 | 7062 | 0.987 | **-0.013** |
| QV | CAGGTC | 3617.45 | 3213 | 0.888 | **-0.119** |
| QV | CAGGTT | 2825.43 | 2269 | 0.803 | **-0.219** |
| QV | CAGGTA | 1834.65 | 1290 | 0.703 | **-0.352** |
| QW | CAGTGG | 3057.92 | 3447 | 1.127 | **0.120** |
| QW | CAATGG | 1095.08 | 706 | 0.645 | **-0.439** |
| QY | CAATAT | 1029.01 | 1120 | 1.088 | **0.085** |
| QY | CAGTAC | 3536.21 | 3820 | 1.080 | **0.077** |
| QY | CAGTAT | 2873.43 | 2979 | 1.037 | **0.036** |
| QY | CAATAC | 1266.36 | 786 | 0.621 | **-0.477** |
| RA | CGGGCG | 659.18 | 1185 | 1.798 | **0.587** |
| RA | CGGGCC | 2437.97 | 3513 | 1.441 | **0.365** |
| RA | AGAGCA | 1415.51 | 1970 | 1.392 | **0.331** |
| RA | CGCGCG | 602.71 | 827 | 1.372 | **0.316** |
| RA | CGTGCC | 954.35 | 1266 | 1.327 | **0.283** |
| RA | CGAGCA | 760.84 | 970 | 1.275 | **0.243** |
| RA | CGAGCT | 869.13 | 1108 | 1.275 | **0.243** |
| RA | CGAGCC | 1321.57 | 1595 | 1.207 | **0.188** |
| RA | AGAGCT | 1616.99 | 1949 | 1.205 | **0.187** |
| RA | CGTGCT | 627.63 | 744 | 1.185 | **0.170** |
| RA | CGGGCA | 1403.55 | 1612 | 1.149 | **0.138** |
| RA | CGTGCA | 549.43 | 570 | 1.037 | **0.037** |
| RA | CGTGCG | 258.04 | 250 | 0.969 | **-0.032** |

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| --- | --- | --- | --- | --- | --- |
| RA | CGAGCG | 357.33 | 341 | 0.954 | **-0.047** |
| RA | AGGGCC | 2413.81 | 2173 | 0.900 | **-0.105** |
| RA | AGAGCC | 2458.73 | 2202 | 0.896 | **-0.110** |
| RA | CGGGCT | 1603.33 | 1435 | 0.895 | **-0.111** |
| RA | AGGGCA | 1389.65 | 1242 | 0.894 | **-0.112** |
| RA | AGGGCT | 1587.45 | 1311 | 0.826 | **-0.191** |
| RA | AGGGCG | 652.65 | 524 | 0.803 | **-0.220** |
| RA | CGCGCC | 2229.09 | 1712 | 0.768 | **-0.264** |
| RA | AGAGCG | 664.79 | 384 | 0.578 | **-0.549** |
| RA | CGCGCA | 1283.30 | 331 | 0.258 | **-1.355** |
| RA | CGCGCT | 1465.97 | 369 | 0.252 | **-1.379** |
| RC | CGCTGC | 986.26 | 2873 | 2.913 | **1.069** |
| RC | CGCTGT | 830.71 | 1313 | 1.581 | **0.458** |
| RC | CGTTGT | 355.66 | 320 | 0.900 | **-0.106** |
| RC | CGTTGC | 422.25 | 372 | 0.881 | **-0.127** |
| RC | AGATGT | 916.29 | 806 | 0.880 | **-0.128** |
| RC | CGATGT | 492.51 | 421 | 0.855 | **-0.157** |
| RC | AGGTGT | 899.55 | 671 | 0.746 | **-0.293** |
| RC | AGGTGC | 1067.99 | 758 | 0.710 | **-0.343** |
| RC | CGATGC | 584.73 | 381 | 0.652 | **-0.428** |
| RC | CGGTGC | 1078.67 | 660 | 0.612 | **-0.491** |
| RC | AGATGC | 1087.86 | 642 | 0.590 | **-0.527** |
| RC | CGGTGT | 908.55 | 414 | 0.456 | **-0.786** |
| RD | AGAGAT | 2027.66 | 2952 | 1.456 | **0.376** |
| RD | CGGGAC | 2271.13 | 3231 | 1.423 | **0.353** |
| RD | CGAGAT | 1089.87 | 1500 | 1.376 | **0.319** |
| RD | CGAGAC | 1231.14 | 1693 | 1.375 | **0.319** |
| RD | CGTGAC | 889.05 | 1044 | 1.174 | **0.161** |
| RD | AGAGAC | 2290.48 | 2433 | 1.062 | **0.060** |
| RD | CGTGAT | 787.04 | 833 | 1.058 | **0.057** |
| RD | AGGGAC | 2248.63 | 2322 | 1.033 | **0.032** |
| RD | AGGGAT | 1990.62 | 1732 | 0.870 | **-0.139** |
| RD | CGGGAT | 2010.54 | 1606 | 0.799 | **-0.225** |
| RD | CGCGAC | 2076.56 | 1092 | 0.526 | **-0.643** |
| RD | CGCGAT | 1838.29 | 313 | 0.170 | **-1.770** |
| RE | AGAGAA | 2644.21 | 4195 | 1.586 | **0.462** |
| RE | CGGGAG | 3506.29 | 5344 | 1.524 | **0.421** |
| RE | CGAGAG | 1900.69 | 2475 | 1.302 | **0.264** |
| RE | CGAGAA | 1421.27 | 1844 | 1.297 | **0.260** |
| RE | CGTGAG | 1372.55 | 1453 | 1.059 | **0.057** |
| RE | AGGGAG | 3471.55 | 3469 | 0.999 | **-0.001** |
| RE | AGAGAG | 3536.15 | 3392 | 0.959 | **-0.042** |
| RE | CGTGAA | 1026.35 | 947 | 0.923 | **-0.080** |
| RE | AGGGAA | 2595.91 | 2343 | 0.903 | **-0.103** |
| RE | CGGGAA | 2621.88 | 2131 | 0.813 | **-0.207** |
| RE | CGCGAG | 3205.89 | 1839 | 0.574 | **-0.556** |
| RE | CGCGAA | 2397.25 | 268 | 0.112 | **-2.191** |
| RF | CGCTTC | 1446.49 | 3411 | 2.358 | **0.858** |
| RF | CGTTTC | 619.29 | 823 | 1.329 | **0.284** |
| RF | CGTTTT | 541.07 | 705 | 1.303 | **0.265** |
| RF | AGATTT | 1393.96 | 1531 | 1.098 | **0.094** |
| RF | CGCTTT | 1263.77 | 1366 | 1.081 | **0.078** |
| RF | CGATTT | 749.26 | 772 | 1.030 | **0.030** |

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| --- | --- | --- | --- | --- | --- |
| RF | AGGTTT | 1368.50 | 1295 | 0.946 | **-0.055** |
| RF | AGGTTC | 1566.36 | 1192 | 0.761 | **-0.273** |
| RF | CGATTC | 857.59 | 632 | 0.737 | **-0.305** |
| RF | CGGTTC | 1582.03 | 951 | 0.601 | **-0.509** |
| RF | AGATTC | 1595.50 | 944 | 0.592 | **-0.525** |
| RF | CGGTTT | 1382.19 | 744 | 0.538 | **-0.619** |
| RG | CGTGGT | 370.38 | 685 | 1.849 | **0.615** |
| RG | CGTGGG | 558.50 | 980 | 1.755 | **0.562** |
| RG | CGTGGC | 775.66 | 1315 | 1.695 | **0.528** |
| RG | CGAGGA | 792.21 | 1266 | 1.598 | **0.469** |
| RG | CGAGGG | 773.39 | 1219 | 1.576 | **0.455** |
| RG | AGAGGA | 1473.87 | 2281 | 1.548 | **0.437** |
| RG | CGAGGT | 512.89 | 789 | 1.538 | **0.431** |
| RG | CGGGGC | 1981.48 | 2952 | 1.490 | **0.399** |
| RG | CGTGGA | 572.08 | 844 | 1.475 | **0.389** |
| RG | CGAGGC | 1074.12 | 1569 | 1.461 | **0.379** |
| RG | AGAGGT | 954.21 | 1128 | 1.182 | **0.167** |
| RG | CGGGGT | 946.15 | 918 | 0.970 | **-0.030** |
| RG | CGCGGC | 1811.72 | 1574 | 0.869 | **-0.141** |
| RG | AGGGGC | 1961.86 | 1660 | 0.846 | **-0.167** |
| RG | AGAGGC | 1998.36 | 1680 | 0.841 | **-0.174** |
| RG | AGAGGG | 1438.87 | 1203 | 0.836 | **-0.179** |
| RG | AGGGGT | 936.78 | 777 | 0.829 | **-0.187** |
| RG | CGGGGG | 1426.72 | 1146 | 0.803 | **-0.219** |
| RG | CGGGGA | 1461.42 | 1140 | 0.780 | **-0.248** |
| RG | CGCGGG | 1304.48 | 904 | 0.693 | **-0.367** |
| RG | AGGGGA | 1446.94 | 923 | 0.638 | **-0.450** |
| RG | AGGGGG | 1412.58 | 683 | 0.484 | **-0.727** |
| RG | CGCGGT | 865.09 | 248 | 0.287 | **-1.249** |
| RG | CGCGGA | 1336.22 | 302 | 0.226 | **-1.487** |
| RH | CGCCAC | 1288.00 | 1861 | 1.445 | **0.368** |
| RH | CGGCAC | 1408.69 | 1707 | 1.212 | **0.192** |
| RH | AGACAT | 1030.24 | 1201 | 1.166 | **0.153** |
| RH | CGTCAT | 399.89 | 447 | 1.118 | **0.111** |
| RH | AGGCAT | 1011.41 | 988 | 0.977 | **-0.023** |
| RH | CGACAT | 553.75 | 530 | 0.957 | **-0.044** |
| RH | AGGCAC | 1394.73 | 1292 | 0.926 | **-0.077** |
| RH | AGACAC | 1420.69 | 1212 | 0.853 | **-0.159** |
| RH | CGTCAC | 551.44 | 468 | 0.849 | **-0.164** |
| RH | CGACAC | 763.62 | 614 | 0.804 | **-0.218** |
| RH | CGCCAT | 934.02 | 728 | 0.779 | **-0.249** |
| RH | CGGCAT | 1021.53 | 730 | 0.715 | **-0.336** |
| RI | CGCATC | 1625.56 | 2948 | 1.814 | **0.595** |
| RI | AGAATA | 652.11 | 1175 | 1.802 | **0.589** |
| RI | AGAATT | 1417.90 | 2185 | 1.541 | **0.432** |
| RI | AGGATA | 640.20 | 804 | 1.256 | **0.228** |
| RI | CGAATA | 350.51 | 439 | 1.252 | **0.225** |
| RI | CGAATT | 762.13 | 850 | 1.115 | **0.109** |
| RI | AGGATT | 1392.00 | 1366 | 0.981 | **-0.019** |
| RI | AGGATC | 1760.27 | 1662 | 0.944 | **-0.057** |
| RI | CGAATC | 963.75 | 802 | 0.832 | **-0.184** |
| RI | CGGATC | 1777.88 | 1479 | 0.832 | **-0.184** |
| RI | AGAATC | 1793.03 | 1389 | 0.775 | **-0.255** |

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| RI | CGTATT | 550.36 | 408 | 0.741 | **-0.299** |
| RI | CGCATT | 1285.48 | 913 | 0.710 | **-0.342** |
| RI | CGGATA | 646.60 | 451 | 0.697 | **-0.360** |
| RI | CGTATC | 695.96 | 440 | 0.632 | **-0.459** |
| RI | CGTATA | 253.12 | 152 | 0.601 | **-0.510** |
| RI | CGGATT | 1405.93 | 825 | 0.587 | **-0.533** |
| RI | CGCATA | 591.21 | 276 | 0.467 | **-0.762** |
| RK | AGGAAG | 3199.71 | 4856 | 1.518 | **0.417** |
| RK | AGGAAA | 2470.61 | 3737 | 1.513 | **0.414** |
| RK | AGAAAA | 2516.58 | 3482 | 1.384 | **0.325** |
| RK | CGCAAG | 2954.85 | 2981 | 1.009 | **0.009** |
| RK | CGGAAG | 3231.73 | 3225 | 0.998 | **-0.002** |
| RK | AGAAAG | 3259.25 | 2909 | 0.893 | **-0.114** |
| RK | CGAAAA | 1352.67 | 1189 | 0.879 | **-0.129** |
| RK | CGGAAA | 2495.33 | 1834 | 0.735 | **-0.308** |
| RK | CGAAAG | 1751.85 | 1265 | 0.722 | **-0.326** |
| RK | CGTAAA | 976.81 | 566 | 0.579 | **-0.546** |
| RK | CGCAAA | 2281.54 | 1209 | 0.530 | **-0.635** |
| RK | CGTAAG | 1265.08 | 503 | 0.398 | **-0.922** |
| RL | CGCCTC | 1491.12 | 2511 | 1.684 | **0.521** |
| RL | CGCCTG | 3098.73 | 4809 | 1.552 | **0.439** |
| RL | CGGCTG | 3389.08 | 5029 | 1.484 | **0.395** |
| RL | CGGCTC | 1630.84 | 2301 | 1.411 | **0.344** |
| RL | CGTTTA | 256.76 | 337 | 1.313 | **0.272** |
| RL | AGATTA | 661.49 | 862 | 1.303 | **0.265** |
| RL | CGTCTT | 440.20 | 562 | 1.277 | **0.244** |
| RL | CGTCTA | 237.40 | 296 | 1.247 | **0.221** |
| RL | CGTTTG | 431.33 | 526 | 1.219 | **0.198** |
| RL | CGTCTC | 638.40 | 723 | 1.133 | **0.124** |
| RL | AGGCTA | 600.44 | 669 | 1.114 | **0.108** |
| RL | AGACTT | 1134.11 | 1227 | 1.082 | **0.079** |
| RL | AGGCTG | 3355.51 | 3531 | 1.052 | **0.051** |
| RL | AGACTA | 611.62 | 617 | 1.009 | **0.009** |
| RL | AGGCTT | 1113.39 | 1104 | 0.992 | **-0.008** |
| RL | CGACTA | 328.75 | 324 | 0.986 | **-0.015** |
| RL | CGGCTA | 606.45 | 593 | 0.978 | **-0.022** |
| RL | CGTCTG | 1326.68 | 1281 | 0.966 | **-0.035** |
| RL | AGGCTC | 1614.68 | 1540 | 0.954 | **-0.047** |
| RL | CGATTA | 355.55 | 337 | 0.948 | **-0.054** |
| RL | CGACTT | 609.59 | 576 | 0.945 | **-0.057** |
| RL | CGCCTA | 554.49 | 501 | 0.904 | **-0.101** |
| RL | AGGTTA | 649.40 | 586 | 0.902 | **-0.103** |
| RL | CGCCTT | 1028.19 | 862 | 0.838 | **-0.176** |
| RL | CGCTTG | 1007.46 | 804 | 0.798 | **-0.226** |
| RL | CGGCTT | 1124.53 | 866 | 0.770 | **-0.261** |
| RL | AGATTG | 1111.24 | 839 | 0.755 | **-0.281** |
| RL | CGACTC | 884.04 | 663 | 0.750 | **-0.288** |
| RL | AGGTTG | 1090.94 | 774 | 0.709 | **-0.343** |
| RL | AGACTC | 1644.73 | 1142 | 0.694 | **-0.365** |
| RL | CGATTG | 597.29 | 408 | 0.683 | **-0.381** |
| RL | CGACTG | 1837.15 | 1128 | 0.614 | **-0.488** |
| RL | CGCTTA | 599.71 | 345 | 0.575 | **-0.553** |
| RL | CGGTTG | 1101.86 | 566 | 0.514 | **-0.666** |

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| RL | AGACTG | 3417.95 | 1701 | 0.498 | **-0.698** |
| RL | CGGTTA | 655.90 | 297 | 0.453 | **-0.792** |
| RM | CGCATG | 1558.32 | 1961 | 1.258 | **0.230** |
| RM | AGGATG | 1687.45 | 1974 | 1.170 | **0.157** |
| RM | CGAATG | 923.88 | 932 | 1.009 | **0.009** |
| RM | AGAATG | 1718.85 | 1690 | 0.983 | **-0.017** |
| RM | CGGATG | 1704.33 | 1374 | 0.806 | **-0.215** |
| RM | CGTATG | 667.17 | 329 | 0.493 | **-0.707** |
| RN | AGAAAT | 1568.88 | 2627 | 1.674 | **0.515** |
| RN | AGGAAC | 1696.37 | 2200 | 1.297 | **0.260** |
| RN | AGGAAT | 1540.22 | 1796 | 1.166 | **0.154** |
| RN | AGAAAC | 1727.93 | 1949 | 1.128 | **0.120** |
| RN | CGAAAT | 843.28 | 930 | 1.103 | **0.098** |
| RN | CGCAAC | 1566.55 | 1575 | 1.005 | **0.005** |
| RN | CGGAAC | 1713.34 | 1621 | 0.946 | **-0.055** |
| RN | CGAAAC | 928.77 | 784 | 0.844 | **-0.169** |
| RN | CGGAAT | 1555.63 | 1002 | 0.644 | **-0.440** |
| RN | CGTAAT | 608.96 | 340 | 0.558 | **-0.583** |
| RN | CGCAAT | 1422.36 | 711 | 0.500 | **-0.693** |
| RN | CGTAAC | 670.70 | 308 | 0.459 | **-0.778** |
| RP | CGGCCG | 587.88 | 1226 | 2.085 | **0.735** |
| RP | CGGCCC | 1622.47 | 2939 | 1.811 | **0.594** |
| RP | CGCCCG | 537.51 | 717 | 1.334 | **0.288** |
| RP | AGGCCC | 1606.39 | 1982 | 1.234 | **0.210** |
| RP | AGGCCG | 582.05 | 666 | 1.144 | **0.135** |
| RP | AGGCCT | 1438.75 | 1642 | 1.141 | **0.132** |
| RP | AGGCCA | 1388.57 | 1511 | 1.088 | **0.084** |
| RP | CGTCCT | 568.84 | 589 | 1.035 | **0.035** |
| RP | AGACCA | 1414.41 | 1387 | 0.981 | **-0.020** |
| RP | CGGCCT | 1453.14 | 1390 | 0.957 | **-0.044** |
| RP | AGACCT | 1465.52 | 1398 | 0.954 | **-0.047** |
| RP | CGTCCC | 635.12 | 582 | 0.916 | **-0.087** |
| RP | CGGCCA | 1402.47 | 1285 | 0.916 | **-0.087** |
| RP | CGCCCC | 1483.46 | 1320 | 0.890 | **-0.117** |
| RP | CGTCCA | 549.00 | 487 | 0.887 | **-0.120** |
| RP | AGACCC | 1636.29 | 1283 | 0.784 | **-0.243** |
| RP | CGACCA | 760.25 | 591 | 0.777 | **-0.252** |
| RP | CGACCC | 879.51 | 671 | 0.763 | **-0.271** |
| RP | CGACCT | 787.72 | 580 | 0.736 | **-0.306** |
| RP | CGCCCA | 1282.31 | 887 | 0.692 | **-0.369** |
| RP | CGTCCG | 230.13 | 159 | 0.691 | **-0.370** |
| RP | CGCCCT | 1328.65 | 830 | 0.625 | **-0.470** |
| RP | CGACCG | 318.68 | 184 | 0.577 | **-0.549** |
| RP | AGACCG | 592.88 | 246 | 0.415 | **-0.880** |
| RQ | AGACAA | 1054.78 | 1456 | 1.380 | **0.322** |
| RQ | CGGCAG | 2920.52 | 3950 | 1.352 | **0.302** |
| RQ | CGCCAG | 2670.31 | 3160 | 1.183 | **0.168** |
| RQ | AGGCAA | 1035.51 | 1177 | 1.137 | **0.128** |
| RQ | AGGCAG | 2891.59 | 3013 | 1.042 | **0.041** |
| RQ | CGACAA | 566.95 | 522 | 0.921 | **-0.083** |
| RQ | CGTCAG | 1143.25 | 953 | 0.834 | **-0.182** |
| RQ | CGTCAA | 409.41 | 327 | 0.799 | **-0.225** |
| RQ | CGACAG | 1583.16 | 1249 | 0.789 | **-0.237** |

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| RQ | CGGCAA | 1045.87 | 763 | 0.730 | **-0.315** |
| RQ | AGACAG | 2945.39 | 2062 | 0.700 | **-0.357** |
| RQ | CGCCAA | 956.27 | 591 | 0.618 | **-0.481** |
| RR | CGCCGC | 1172.08 | 2232 | 1.904 | **0.644** |
| RR | CGGCGG | 1402.02 | 2316 | 1.652 | **0.502** |
| RR | AGAAGA | 1426.00 | 2307 | 1.618 | **0.481** |
| RR | CGGCGC | 1281.90 | 2064 | 1.610 | **0.476** |
| RR | AGGAGG | 1374.38 | 1973 | 1.436 | **0.362** |
| RR | CGCCGG | 1281.90 | 1679 | 1.310 | **0.270** |
| RR | CGAAGA | 766.48 | 987 | 1.288 | **0.253** |
| RR | AGGAGA | 1399.95 | 1758 | 1.256 | **0.228** |
| RR | CGCAGG | 1269.20 | 1565 | 1.233 | **0.209** |
| RR | CGGAGG | 1388.13 | 1670 | 1.203 | **0.185** |
| RR | CGTCGT | 214.84 | 228 | 1.061 | **0.059** |
| RR | CGAAGG | 752.48 | 770 | 1.023 | **0.023** |
| RR | CGCCGT | 501.81 | 502 | 1.000 | **0.000** |
| RR | AGAAGG | 1399.95 | 1325 | 0.946 | **-0.055** |
| RR | CGGCGT | 548.83 | 498 | 0.907 | **-0.097** |
| RR | CGTCGA | 297.51 | 265 | 0.891 | **-0.116** |
| RR | CGGCGA | 760.01 | 675 | 0.888 | **-0.119** |
| RR | CGTCGC | 501.81 | 438 | 0.873 | **-0.136** |
| RR | AGGCGG | 1388.13 | 1177 | 0.848 | **-0.165** |
| RR | CGTCGG | 548.83 | 450 | 0.820 | **-0.199** |
| RR | CGACGT | 297.51 | 241 | 0.810 | **-0.211** |
| RR | CGCCGA | 694.89 | 547 | 0.787 | **-0.239** |
| RR | AGGCGA | 752.48 | 570 | 0.757 | **-0.278** |
| RR | CGGAGA | 1413.96 | 1068 | 0.755 | **-0.281** |
| RR | AGACGA | 766.48 | 557 | 0.727 | **-0.319** |
| RR | AGGCGT | 543.39 | 383 | 0.705 | **-0.350** |
| RR | AGGCGC | 1269.20 | 889 | 0.700 | **-0.356** |
| RR | AGACGT | 553.50 | 376 | 0.679 | **-0.387** |
| RR | CGACGA | 411.98 | 272 | 0.660 | **-0.415** |
| RR | CGCAGA | 1292.82 | 771 | 0.596 | **-0.517** |
| RR | CGACGG | 760.01 | 411 | 0.541 | **-0.615** |
| RR | CGACGC | 694.89 | 368 | 0.530 | **-0.636** |
| RR | CGTAGA | 553.50 | 271 | 0.490 | **-0.714** |
| RR | CGTAGG | 543.39 | 235 | 0.432 | **-0.838** |
| RR | AGACGC | 1292.82 | 524 | 0.405 | **-0.903** |
| RR | AGACGG | 1413.96 | 569 | 0.402 | **-0.910** |
| RS | CGCTCG | 332.61 | 817 | 2.456 | **0.899** |
| RS | CGCAGC | 1425.00 | 2853 | 2.002 | **0.694** |
| RS | CGCTCC | 1257.78 | 2184 | 1.736 | **0.552** |
| RS | AGAAGT | 991.66 | 1532 | 1.545 | **0.435** |
| RS | CGTTCT | 468.44 | 687 | 1.467 | **0.383** |
| RS | CGAAGT | 533.02 | 728 | 1.366 | **0.312** |
| RS | CGTTCC | 538.50 | 707 | 1.313 | **0.272** |
| RS | AGGAGC | 1543.09 | 1992 | 1.291 | **0.255** |
| RS | CGTTCA | 378.71 | 471 | 1.244 | **0.218** |
| RS | CGGAGC | 1558.53 | 1856 | 1.191 | **0.175** |
| RS | AGGAGT | 973.54 | 1071 | 1.100 | **0.095** |
| RS | AGAAGC | 1571.80 | 1628 | 1.036 | **0.035** |
| RS | AGATCA | 975.67 | 1000 | 1.025 | **0.025** |
| RS | CGAAGC | 844.85 | 859 | 1.017 | **0.017** |

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| RS | CGCTCA | 884.55 | 860 | 0.972 | **-0.028** |
| RS | CGCAGT | 899.04 | 853 | 0.949 | **-0.053** |
| RS | AGATCT | 1206.86 | 1106 | 0.916 | **-0.087** |
| RS | CGCTCT | 1094.14 | 942 | 0.861 | **-0.150** |
| RS | CGTTCG | 142.40 | 121 | 0.850 | **-0.163** |
| RS | AGGTCA | 957.85 | 808 | 0.844 | **-0.170** |
| RS | CGATCA | 524.43 | 416 | 0.793 | **-0.232** |
| RS | AGGTCT | 1184.81 | 939 | 0.793 | **-0.233** |
| RS | AGGTCG | 360.17 | 284 | 0.789 | **-0.238** |
| RS | CGATCT | 648.69 | 497 | 0.766 | **-0.266** |
| RS | AGGTCC | 1362.00 | 1036 | 0.761 | **-0.274** |
| RS | CGGAGT | 983.28 | 745 | 0.758 | **-0.278** |
| RS | CGTAGT | 384.91 | 278 | 0.722 | **-0.325** |
| RS | CGGTCG | 363.77 | 235 | 0.646 | **-0.437** |
| RS | CGATCC | 745.70 | 455 | 0.610 | **-0.494** |
| RS | AGATCC | 1387.35 | 830 | 0.598 | **-0.514** |
| RS | CGGTCC | 1375.63 | 821 | 0.597 | **-0.516** |
| RS | CGATCG | 197.19 | 107 | 0.543 | **-0.611** |
| RS | CGGTCA | 967.43 | 507 | 0.524 | **-0.646** |
| RS | CGTAGC | 610.09 | 317 | 0.520 | **-0.655** |
| RS | AGATCG | 366.87 | 177 | 0.482 | **-0.729** |
| RS | CGGTCT | 1196.66 | 518 | 0.433 | **-0.837** |
| RT | CGCACG | 450.78 | 858 | 1.903 | **0.644** |
| RT | AGAACT | 1083.61 | 1467 | 1.354 | **0.303** |
| RT | CGCACC | 1372.27 | 1821 | 1.327 | **0.283** |
| RT | AGGACG | 488.14 | 646 | 1.323 | **0.280** |
| RT | AGGACT | 1063.81 | 1389 | 1.306 | **0.267** |
| RT | AGAACA | 1225.34 | 1575 | 1.285 | **0.251** |
| RT | AGGACA | 1202.96 | 1523 | 1.266 | **0.236** |
| RT | AGGACC | 1485.98 | 1773 | 1.193 | **0.177** |
| RT | CGGACG | 493.02 | 537 | 1.089 | **0.085** |
| RT | CGAACA | 658.62 | 661 | 1.004 | **0.004** |
| RT | CGAACT | 582.44 | 556 | 0.955 | **-0.046** |
| RT | CGGACC | 1500.85 | 1408 | 0.938 | **-0.064** |
| RT | CGCACA | 1110.90 | 984 | 0.886 | **-0.121** |
| RT | CGGACA | 1215.00 | 949 | 0.781 | **-0.247** |
| RT | AGAACC | 1513.63 | 1166 | 0.770 | **-0.261** |
| RT | CGTACT | 420.60 | 313 | 0.744 | **-0.295** |
| RT | CGAACC | 813.58 | 599 | 0.736 | **-0.306** |
| RT | CGGACT | 1074.45 | 712 | 0.663 | **-0.411** |
| RT | CGCACT | 982.40 | 638 | 0.649 | **-0.432** |
| RT | CGTACC | 587.52 | 361 | 0.614 | **-0.487** |
| RT | AGAACG | 497.22 | 302 | 0.607 | **-0.499** |
| RT | CGTACA | 475.62 | 288 | 0.606 | **-0.502** |
| RT | CGAACG | 267.26 | 154 | 0.576 | **-0.551** |
| RT | CGTACG | 193.00 | 79 | 0.409 | **-0.893** |
| RV | CGTGTG | 889.90 | 1699 | 1.909 | **0.647** |
| RV | CGTGTC | 449.83 | 826 | 1.836 | **0.608** |
| RV | CGAGTA | 315.92 | 562 | 1.779 | **0.576** |
| RV | CGTGTA | 228.14 | 391 | 1.714 | **0.539** |
| RV | CGTGTT | 351.34 | 565 | 1.608 | **0.475** |
| RV | AGAGTT | 905.17 | 1350 | 1.491 | **0.400** |
| RV | AGAGTA | 587.76 | 876 | 1.490 | **0.399** |

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| RV | CGAGTC | 622.91 | 914 | 1.467 | **0.383** |
| RV | CGAGTT | 486.53 | 681 | 1.400 | **0.336** |
| RV | CGAGTG | 1232.31 | 1576 | 1.279 | **0.246** |
| RV | CGGGTC | 1149.12 | 1310 | 1.140 | **0.131** |
| RV | AGGGTC | 1137.73 | 1221 | 1.073 | **0.071** |
| RV | CGGGTG | 2273.30 | 2328 | 1.024 | **0.024** |
| RV | AGAGTC | 1158.91 | 1154 | 0.996 | **-0.004** |
| RV | CGCGTG | 2078.54 | 1725 | 0.830 | **-0.186** |
| RV | AGGGTA | 577.02 | 471 | 0.816 | **-0.203** |
| RV | AGAGTG | 2292.67 | 1750 | 0.763 | **-0.270** |
| RV | CGGGTA | 582.79 | 438 | 0.752 | **-0.286** |
| RV | AGGGTG | 2250.78 | 1658 | 0.737 | **-0.306** |
| RV | CGCGTC | 1050.67 | 763 | 0.726 | **-0.320** |
| RV | AGGGTT | 888.63 | 645 | 0.726 | **-0.320** |
| RV | CGGGTT | 897.52 | 548 | 0.611 | **-0.493** |
| RV | CGCGTA | 532.86 | 132 | 0.248 | **-1.395** |
| RV | CGCGTT | 820.63 | 178 | 0.217 | **-1.528** |
| RW | CGCTGG | 1038.00 | 2199 | 2.118 | **0.751** |
| RW | CGTTGG | 444.40 | 380 | 0.855 | **-0.157** |
| RW | AGGTGG | 1124.01 | 876 | 0.779 | **-0.249** |
| RW | CGATGG | 615.40 | 466 | 0.757 | **-0.278** |
| RW | AGATGG | 1144.93 | 804 | 0.702 | **-0.353** |
| RW | CGGTGG | 1135.26 | 777 | 0.684 | **-0.379** |
| RY | CGCTAC | 1173.12 | 2612 | 2.227 | **0.800** |
| RY | CGCTAT | 953.25 | 1198 | 1.257 | **0.229** |
| RY | CGTTAC | 502.25 | 565 | 1.125 | **0.118** |
| RY | CGTTAT | 408.12 | 459 | 1.125 | **0.117** |
| RY | AGATAT | 1051.45 | 1018 | 0.968 | **-0.032** |
| RY | AGATAC | 1293.97 | 1239 | 0.958 | **-0.043** |
| RY | CGATAT | 565.15 | 509 | 0.901 | **-0.105** |
| RY | CGATAC | 695.51 | 584 | 0.840 | **-0.175** |
| RY | AGGTAC | 1270.33 | 1007 | 0.793 | **-0.232** |
| RY | AGGTAT | 1032.24 | 769 | 0.745 | **-0.294** |
| RY | CGGTAC | 1283.04 | 856 | 0.667 | **-0.405** |
| RY | CGGTAT | 1042.57 | 455 | 0.436 | **-0.829** |
| SA | TCGGCG | 241.39 | 778 | 3.223 | **1.170** |
| SA | TCGGCC | 892.76 | 1976 | 2.213 | **0.795** |
| SA | TCAGCA | 1366.87 | 2526 | 1.848 | **0.614** |
| SA | TCTGCA | 1690.75 | 3035 | 1.795 | **0.585** |
| SA | TCTGCT | 1931.41 | 3350 | 1.734 | **0.551** |
| SA | TCAGCT | 1561.43 | 2630 | 1.684 | **0.521** |
| SA | AGTGCT | 1587.01 | 2487 | 1.567 | **0.449** |
| SA | AGTGCA | 1389.27 | 2040 | 1.468 | **0.384** |
| SA | AGTGCC | 2413.15 | 3437 | 1.424 | **0.354** |
| SA | TCAGCC | 2374.25 | 3294 | 1.387 | **0.327** |
| SA | TCGGCT | 587.12 | 808 | 1.376 | **0.319** |
| SA | TCTGCC | 2936.83 | 3480 | 1.185 | **0.170** |
| SA | TCGGCA | 513.97 | 598 | 1.163 | **0.151** |
| SA | TCTGCG | 794.06 | 745 | 0.938 | **-0.064** |
| SA | TCAGCG | 641.95 | 584 | 0.910 | **-0.095** |
| SA | AGTGCG | 652.47 | 532 | 0.815 | **-0.204** |
| SA | AGCGCG | 1034.18 | 802 | 0.775 | **-0.254** |
| SA | AGCGCC | 3824.90 | 2428 | 0.635 | **-0.454** |

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| --- | --- | --- | --- | --- | --- |
| SA | TCCGCG | 912.82 | 577 | 0.632 | **-0.459** |
| SA | TCCGCC | 3376.05 | 1230 | 0.364 | **-1.010** |
| SA | AGCGCT | 2515.45 | 709 | 0.282 | **-1.266** |
| SA | AGCGCA | 2202.02 | 601 | 0.273 | **-1.299** |
| SA | TCCGCA | 1943.61 | 476 | 0.245 | **-1.407** |
| SA | TCCGCT | 2220.26 | 481 | 0.217 | **-1.530** |
| SC | TCCTGC | 1640.34 | 2828 | 1.724 | **0.545** |
| SC | AGCTGC | 1858.43 | 3034 | 1.633 | **0.490** |
| SC | TCCTGT | 1381.63 | 1779 | 1.288 | **0.253** |
| SC | AGCTGT | 1565.33 | 1922 | 1.228 | **0.205** |
| SC | TCGTGC | 433.77 | 361 | 0.832 | **-0.184** |
| SC | TCTTGT | 1201.89 | 941 | 0.783 | **-0.245** |
| SC | AGTTGT | 987.57 | 698 | 0.707 | **-0.347** |
| SC | TCGTGT | 365.36 | 225 | 0.616 | **-0.485** |
| SC | TCATGT | 971.65 | 584 | 0.601 | **-0.509** |
| SC | TCTTGC | 1426.94 | 758 | 0.531 | **-0.633** |
| SC | TCATGC | 1153.59 | 525 | 0.455 | **-0.787** |
| SC | AGTTGC | 1172.49 | 504 | 0.430 | **-0.844** |
| SD | TCAGAT | 1978.63 | 3706 | 1.873 | **0.628** |
| SD | AGTGAT | 2011.05 | 3683 | 1.831 | **0.605** |
| SD | AGTGAC | 2271.71 | 4040 | 1.778 | **0.576** |
| SD | TCGGAC | 840.43 | 1438 | 1.711 | **0.537** |
| SD | TCTGAT | 2447.46 | 3578 | 1.462 | **0.380** |
| SD | TCAGAC | 2235.09 | 2906 | 1.300 | **0.262** |
| SD | TCGGAT | 744.00 | 840 | 1.129 | **0.121** |
| SD | TCTGAC | 2764.69 | 2949 | 1.067 | **0.065** |
| SD | AGCGAC | 3600.71 | 2017 | 0.560 | **-0.580** |
| SD | TCCGAC | 3178.17 | 1336 | 0.420 | **-0.867** |
| SD | AGCGAT | 3187.56 | 920 | 0.289 | **-1.243** |
| SD | TCCGAT | 2813.50 | 660 | 0.235 | **-1.450** |
| SE | TCAGAA | 2420.84 | 4815 | 1.989 | **0.688** |
| SE | AGTGAA | 2460.50 | 4686 | 1.904 | **0.644** |
| SE | TCGGAG | 1217.33 | 2184 | 1.794 | **0.584** |
| SE | TCTGAA | 2994.45 | 4621 | 1.543 | **0.434** |
| SE | TCAGAG | 3237.43 | 4683 | 1.447 | **0.369** |
| SE | AGTGAG | 3290.47 | 4410 | 1.340 | **0.293** |
| SE | TCTGAG | 4004.54 | 4891 | 1.221 | **0.200** |
| SE | TCGGAA | 910.28 | 879 | 0.966 | **-0.035** |
| SE | AGCGAG | 5215.47 | 2961 | 0.568 | **-0.566** |
| SE | TCCGAG | 4603.44 | 2005 | 0.436 | **-0.831** |
| SE | AGCGAA | 3899.95 | 847 | 0.217 | **-1.527** |
| SE | TCCGAA | 3442.29 | 715 | 0.208 | **-1.572** |
| SF | TCCTTC | 2645.79 | 4407 | 1.666 | **0.510** |
| SF | AGCTTC | 2997.56 | 3942 | 1.315 | **0.274** |
| SF | TCATTT | 1625.65 | 1773 | 1.091 | **0.087** |
| SF | TCCTTT | 2311.58 | 2487 | 1.076 | **0.073** |
| SF | AGTTTT | 1652.29 | 1695 | 1.026 | **0.026** |
| SF | AGCTTT | 2618.91 | 2370 | 0.905 | **-0.100** |
| SF | TCTTTT | 2010.85 | 1809 | 0.900 | **-0.106** |
| SF | TCTTTC | 2301.58 | 1728 | 0.751 | **-0.287** |
| SF | AGTTTC | 1891.18 | 1353 | 0.715 | **-0.335** |
| SF | TCGTTT | 611.27 | 342 | 0.559 | **-0.581** |
| SF | TCATTC | 1860.69 | 991 | 0.533 | **-0.630** |

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| --- | --- | --- | --- | --- | --- |
| SF | TCGTTC | 699.65 | 330 | 0.472 | **-0.751** |
| SG | AGTGGT | 1051.00 | 2094 | 1.992 | **0.689** |
| SG | TCGGGG | 586.31 | 1117 | 1.905 | **0.645** |
| SG | TCGGGC | 814.29 | 1487 | 1.826 | **0.602** |
| SG | AGTGGA | 1623.36 | 2932 | 1.806 | **0.591** |
| SG | TCAGGA | 1597.19 | 2760 | 1.728 | **0.547** |
| SG | TCTGGA | 1975.64 | 3391 | 1.716 | **0.540** |
| SG | AGTGGG | 1584.81 | 2584 | 1.630 | **0.489** |
| SG | TCTGGG | 1928.73 | 2974 | 1.542 | **0.433** |
| SG | AGTGGC | 2201.05 | 3314 | 1.506 | **0.409** |
| SG | TCTGGT | 1279.07 | 1902 | 1.487 | **0.397** |
| SG | TCAGGG | 1559.26 | 2161 | 1.386 | **0.326** |
| SG | TCAGGT | 1034.06 | 1351 | 1.307 | **0.267** |
| SG | TCGGGA | 600.57 | 684 | 1.139 | **0.130** |
| SG | TCGGGT | 388.82 | 410 | 1.054 | **0.053** |
| SG | TCTGGC | 2678.70 | 2734 | 1.021 | **0.020** |
| SG | TCAGGC | 2165.57 | 2114 | 0.976 | **-0.024** |
| SG | AGCGGC | 3488.72 | 2475 | 0.709 | **-0.343** |
| SG | AGCGGG | 2511.96 | 1464 | 0.583 | **-0.540** |
| SG | TCCGGG | 2217.18 | 1117 | 0.504 | **-0.686** |
| SG | TCCGGC | 3079.31 | 1163 | 0.378 | **-0.974** |
| SG | AGCGGT | 1665.85 | 536 | 0.322 | **-1.134** |
| SG | AGCGGA | 2573.06 | 663 | 0.258 | **-1.356** |
| SG | TCCGGA | 2271.11 | 560 | 0.247 | **-1.400** |
| SG | TCCGGT | 1470.37 | 359 | 0.244 | **-1.410** |
| SH | AGCCAC | 2202.27 | 3210 | 1.458 | **0.377** |
| SH | TCTCAT | 1226.22 | 1426 | 1.163 | **0.151** |
| SH | TCCCAC | 1943.83 | 2233 | 1.149 | **0.139** |
| SH | AGTCAT | 1007.57 | 1082 | 1.074 | **0.071** |
| SH | AGCCAT | 1597.01 | 1606 | 1.006 | **0.006** |
| SH | TCGCAC | 514.03 | 512 | 0.996 | **-0.004** |
| SH | TCCCAT | 1409.60 | 1349 | 0.957 | **-0.044** |
| SH | TCACAT | 991.32 | 929 | 0.937 | **-0.065** |
| SH | AGTCAC | 1389.42 | 1077 | 0.775 | **-0.255** |
| SH | TCACAC | 1367.03 | 956 | 0.699 | **-0.358** |
| SH | TCTCAC | 1690.94 | 1158 | 0.685 | **-0.379** |
| SH | TCGCAT | 372.75 | 174 | 0.467 | **-0.762** |
| SI | TCCATC | 2374.96 | 4526 | 1.906 | **0.645** |
| SI | AGCATC | 2690.72 | 4471 | 1.662 | **0.508** |
| SI | TCCATT | 1878.09 | 2383 | 1.269 | **0.238** |
| SI | AGCATT | 2127.79 | 2384 | 1.120 | **0.114** |
| SI | TCCATA | 863.76 | 963 | 1.115 | **0.109** |
| SI | AGTATA | 617.40 | 640 | 1.037 | **0.036** |
| SI | TCAATA | 607.45 | 618 | 1.017 | **0.017** |
| SI | AGTATT | 1342.43 | 1299 | 0.968 | **-0.033** |
| SI | AGCATA | 978.60 | 943 | 0.964 | **-0.037** |
| SI | TCTATA | 751.38 | 658 | 0.876 | **-0.133** |
| SI | TCTATT | 1633.75 | 1215 | 0.744 | **-0.296** |
| SI | TCAATT | 1320.79 | 957 | 0.725 | **-0.322** |
| SI | AGTATC | 1697.59 | 924 | 0.544 | **-0.608** |
| SI | TCGATA | 228.41 | 109 | 0.477 | **-0.740** |
| SI | TCTATC | 2065.98 | 958 | 0.464 | **-0.769** |
| SI | TCGATT | 496.64 | 185 | 0.373 | **-0.988** |

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| --- | --- | --- | --- | --- | --- |
| SI | TCAATC | 1670.22 | 557 | 0.333 | **-1.098** |
| SI | TCGATC | 628.03 | 184 | 0.293 | **-1.228** |
| SK | TCCAAG | 3563.99 | 5021 | 1.409 | **0.343** |
| SK | TCCAAA | 2751.88 | 3634 | 1.321 | **0.278** |
| SK | AGCAAG | 4037.83 | 5128 | 1.270 | **0.239** |
| SK | AGCAAA | 3117.75 | 3736 | 1.198 | **0.181** |
| SK | TCAAAA | 1935.30 | 2282 | 1.179 | **0.165** |
| SK | AGTAAA | 1967.01 | 2149 | 1.093 | **0.088** |
| SK | TCAAAG | 2506.42 | 2082 | 0.831 | **-0.186** |
| SK | TCTAAA | 2393.86 | 1838 | 0.768 | **-0.264** |
| SK | TCGAAG | 942.46 | 522 | 0.554 | **-0.591** |
| SK | AGTAAG | 2547.49 | 1300 | 0.510 | **-0.673** |
| SK | TCTAAG | 3100.32 | 1569 | 0.506 | **-0.681** |
| SK | TCGAAA | 727.71 | 331 | 0.455 | **-0.788** |
| SL | AGTTTA | 709.05 | 1103 | 1.556 | **0.442** |
| SL | TCGCTG | 1355.42 | 2104 | 1.552 | **0.440** |
| SL | TCCTTG | 1666.44 | 2462 | 1.477 | **0.390** |
| SL | TCTTTA | 862.92 | 1267 | 1.468 | **0.384** |
| SL | AGCCTC | 2794.39 | 4013 | 1.436 | **0.362** |
| SL | TCTTTG | 1449.64 | 2009 | 1.386 | **0.326** |
| SL | TCATTA | 697.62 | 862 | 1.236 | **0.212** |
| SL | AGCCTG | 5807.08 | 7014 | 1.208 | **0.189** |
| SL | AGTTTG | 1191.15 | 1427 | 1.198 | **0.181** |
| SL | TCGCTC | 652.23 | 777 | 1.191 | **0.175** |
| SL | TCTCTA | 797.87 | 950 | 1.191 | **0.175** |
| SL | TCTCTT | 1479.47 | 1750 | 1.183 | **0.168** |
| SL | TCCCTG | 5125.62 | 6034 | 1.177 | **0.163** |
| SL | TCCCTC | 2466.46 | 2805 | 1.137 | **0.129** |
| SL | TCCTTA | 991.98 | 1076 | 1.085 | **0.081** |
| SL | AGTCTT | 1215.66 | 1242 | 1.022 | **0.021** |
| SL | AGCCTT | 1926.85 | 1959 | 1.017 | **0.017** |
| SL | TCACTA | 645.03 | 630 | 0.977 | **-0.024** |
| SL | AGCTTG | 1888.00 | 1786 | 0.946 | **-0.056** |
| SL | TCACTT | 1196.06 | 1111 | 0.929 | **-0.074** |
| SL | TCCCTT | 1700.73 | 1545 | 0.908 | **-0.096** |
| SL | TCCCTA | 917.19 | 810 | 0.883 | **-0.124** |
| SL | AGTCTA | 655.60 | 569 | 0.868 | **-0.142** |
| SL | TCATTG | 1171.95 | 1015 | 0.866 | **-0.144** |
| SL | AGCCTA | 1039.14 | 875 | 0.842 | **-0.172** |
| SL | TCTCTC | 2145.58 | 1760 | 0.820 | **-0.198** |
| SL | TCTCTG | 4458.78 | 3418 | 0.767 | **-0.266** |
| SL | AGCTTA | 1123.86 | 758 | 0.674 | **-0.394** |
| SL | AGTCTC | 1763.00 | 1158 | 0.657 | **-0.420** |
| SL | TCGTTG | 440.67 | 280 | 0.635 | **-0.454** |
| SL | TCACTC | 1734.58 | 1100 | 0.634 | **-0.455** |
| SL | TCACTG | 3604.66 | 2254 | 0.625 | **-0.470** |
| SL | TCGCTT | 449.74 | 279 | 0.620 | **-0.477** |
| SL | TCGCTA | 242.54 | 143 | 0.590 | **-0.528** |
| SL | TCGTTA | 262.32 | 140 | 0.534 | **-0.628** |
| SL | AGTCTG | 3663.72 | 1808 | 0.493 | **-0.706** |
| SM | TCCATG | 2282.65 | 3908 | 1.712 | **0.538** |
| SM | AGCATG | 2586.13 | 3300 | 1.276 | **0.244** |
| SM | TCAATG | 1605.31 | 1129 | 0.703 | **-0.352** |

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| --- | --- | --- | --- | --- | --- |
| SM | TCGATG | 603.62 | 365 | 0.605 | **-0.503** |
| SM | AGTATG | 1631.61 | 966 | 0.592 | **-0.524** |
| SM | TCTATG | 1985.68 | 1027 | 0.517 | **-0.659** |
| SN | AGCAAC | 2539.42 | 3717 | 1.464 | **0.381** |
| SN | TCCAAC | 2241.42 | 3216 | 1.435 | **0.361** |
| SN | TCAAAT | 1431.22 | 1883 | 1.316 | **0.274** |
| SN | AGCAAT | 2305.68 | 2513 | 1.090 | **0.086** |
| SN | TCCAAT | 2035.11 | 2000 | 0.983 | **-0.017** |
| SN | AGTAAT | 1454.67 | 1425 | 0.980 | **-0.021** |
| SN | AGTAAC | 1602.14 | 1339 | 0.836 | **-0.179** |
| SN | TCAAAC | 1576.31 | 1194 | 0.757 | **-0.278** |
| SN | TCTAAT | 1770.34 | 1297 | 0.733 | **-0.311** |
| SN | TCTAAC | 1949.81 | 955 | 0.490 | **-0.714** |
| SN | TCGAAT | 538.16 | 258 | 0.479 | **-0.735** |
| SN | TCGAAC | 592.72 | 240 | 0.405 | **-0.904** |
| SP | TCGCCG | 282.21 | 549 | 1.945 | **0.665** |
| SP | TCGCCC | 778.87 | 1221 | 1.568 | **0.450** |
| SP | TCCCCG | 1067.21 | 1621 | 1.519 | **0.418** |
| SP | TCTCCA | 2214.76 | 3119 | 1.408 | **0.342** |
| SP | AGCCCC | 3336.96 | 4654 | 1.395 | **0.333** |
| SP | TCTCCT | 2294.78 | 2888 | 1.259 | **0.230** |
| SP | AGCCCG | 1209.10 | 1432 | 1.184 | **0.169** |
| SP | TCCCCA | 2545.99 | 2968 | 1.166 | **0.153** |
| SP | TCACCA | 1790.50 | 1869 | 1.044 | **0.043** |
| SP | AGCCCT | 2988.71 | 3086 | 1.033 | **0.032** |
| SP | AGTCCT | 1885.59 | 1904 | 1.010 | **0.010** |
| SP | TCACCT | 1855.20 | 1752 | 0.944 | **-0.057** |
| SP | AGCCCA | 2884.48 | 2607 | 0.904 | **-0.101** |
| SP | TCCCCT | 2637.98 | 2238 | 0.848 | **-0.164** |
| SP | AGTCCA | 1819.84 | 1473 | 0.809 | **-0.211** |
| SP | TCGCCT | 697.59 | 562 | 0.806 | **-0.216** |
| SP | TCGCCA | 673.26 | 541 | 0.804 | **-0.219** |
| SP | TCTCCC | 2562.18 | 2036 | 0.795 | **-0.230** |
| SP | TCACCC | 2071.37 | 1568 | 0.757 | **-0.278** |
| SP | AGTCCC | 2105.31 | 1534 | 0.729 | **-0.317** |
| SP | TCTCCG | 928.37 | 664 | 0.715 | **-0.335** |
| SP | TCCCCC | 2945.37 | 2058 | 0.699 | **-0.358** |
| SP | TCACCG | 750.53 | 426 | 0.568 | **-0.566** |
| SP | AGTCCG | 762.83 | 319 | 0.418 | **-0.872** |
| SQ | TCCCAG | 4427.95 | 5592 | 1.263 | **0.233** |
| SQ | AGCCAG | 5016.65 | 6041 | 1.204 | **0.186** |
| SQ | TCTCAA | 1379.40 | 1644 | 1.192 | **0.175** |
| SQ | AGTCAA | 1133.44 | 1293 | 1.141 | **0.132** |
| SQ | TCACAA | 1115.16 | 1196 | 1.072 | **0.070** |
| SQ | AGCCAA | 1796.52 | 1819 | 1.013 | **0.012** |
| SQ | TCCCAA | 1585.70 | 1474 | 0.930 | **-0.073** |
| SQ | TCTCAG | 3851.88 | 3430 | 0.890 | **-0.116** |
| SQ | TCGCAG | 1170.92 | 1015 | 0.867 | **-0.143** |
| SQ | TCACAG | 3114.02 | 2271 | 0.729 | **-0.316** |
| SQ | AGTCAG | 3165.04 | 2215 | 0.700 | **-0.357** |
| SQ | TCGCAA | 419.32 | 186 | 0.444 | **-0.813** |
| SR | AGCCGC | 1540.23 | 2828 | 1.836 | **0.608** |
| SR | TCCAGG | 1472.14 | 2309 | 1.568 | **0.450** |

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| --- | --- | --- | --- | --- | --- |
| SR | AGCCGG | 1684.56 | 2353 | 1.397 | **0.334** |
| SR | TCCCGG | 1486.87 | 1976 | 1.329 | **0.284** |
| SR | AGCAGG | 1667.87 | 2186 | 1.311 | **0.271** |
| SR | AGCCGT | 659.43 | 857 | 1.300 | **0.262** |
| SR | TCGCGC | 359.50 | 446 | 1.241 | **0.216** |
| SR | TCCAGA | 1499.54 | 1850 | 1.234 | **0.210** |
| SR | TCAAGA | 1054.57 | 1294 | 1.227 | **0.205** |
| SR | TCGCGG | 393.19 | 481 | 1.223 | **0.202** |
| SR | TCCCGC | 1359.49 | 1605 | 1.181 | **0.166** |
| SR | TCTCGA | 701.14 | 826 | 1.178 | **0.164** |
| SR | AGTCGT | 416.04 | 484 | 1.163 | **0.151** |
| SR | TCCCGA | 806.00 | 937 | 1.163 | **0.151** |
| SR | AGCAGA | 1698.90 | 1925 | 1.133 | **0.125** |
| SR | AGCCGA | 913.16 | 1020 | 1.117 | **0.111** |
| SR | TCTCGT | 506.32 | 493 | 0.974 | **-0.027** |
| SR | AGTCGA | 576.12 | 553 | 0.960 | **-0.041** |
| SR | TCCCGT | 582.04 | 553 | 0.950 | **-0.051** |
| SR | TCAAGG | 1035.31 | 922 | 0.891 | **-0.116** |
| SR | TCGAGG | 389.29 | 324 | 0.832 | **-0.184** |
| SR | TCTCGG | 1293.43 | 1062 | 0.821 | **-0.197** |
| SR | TCACGT | 409.33 | 323 | 0.789 | **-0.237** |
| SR | AGTAGA | 1071.85 | 746 | 0.696 | **-0.362** |
| SR | TCGCGT | 153.92 | 102 | 0.663 | **-0.411** |
| SR | AGTCGG | 1062.80 | 675 | 0.635 | **-0.454** |
| SR | AGTCGC | 971.74 | 591 | 0.608 | **-0.497** |
| SR | TCACGA | 566.83 | 344 | 0.607 | **-0.499** |
| SR | TCGAGA | 396.54 | 240 | 0.605 | **-0.502** |
| SR | TCTAGA | 1304.45 | 750 | 0.575 | **-0.553** |
| SR | TCGCGA | 213.14 | 115 | 0.540 | **-0.617** |
| SR | TCTCGC | 1182.62 | 636 | 0.538 | **-0.620** |
| SR | TCACGG | 1045.66 | 534 | 0.511 | **-0.672** |
| SR | TCTAGG | 1280.62 | 574 | 0.448 | **-0.802** |
| SR | TCACGC | 956.08 | 406 | 0.425 | **-0.856** |
| SR | AGTAGG | 1052.27 | 443 | 0.421 | **-0.865** |
| SS | AGCAGC | 3919.72 | 7160 | 1.827 | **0.602** |
| SS | TCGTCG | 213.54 | 376 | 1.761 | **0.566** |
| SS | TCCTCG | 807.53 | 1302 | 1.612 | **0.478** |
| SS | TCCAGC | 3459.74 | 4832 | 1.397 | **0.334** |
| SS | TCTTCA | 1868.19 | 2596 | 1.390 | **0.329** |
| SS | AGCAGT | 2472.97 | 3417 | 1.382 | **0.323** |
| SS | TCCTCC | 3053.74 | 4162 | 1.363 | **0.310** |
| SS | TCTTCT | 2310.85 | 2896 | 1.253 | **0.226** |
| SS | TCCAGT | 2182.77 | 2691 | 1.233 | **0.209** |
| SS | TCATCA | 1510.32 | 1795 | 1.188 | **0.173** |
| SS | AGCTCC | 3459.74 | 4024 | 1.163 | **0.151** |
| SS | TCATCT | 1868.19 | 2118 | 1.134 | **0.126** |
| SS | TCCTCA | 2147.58 | 2413 | 1.124 | **0.117** |
| SS | AGCTCG | 914.89 | 1001 | 1.094 | **0.090** |
| SS | TCCTCT | 2656.45 | 2744 | 1.033 | **0.032** |
| SS | TCGTCC | 807.53 | 818 | 1.013 | **0.013** |
| SS | TCTTCC | 2656.45 | 2600 | 0.979 | **-0.021** |
| SS | AGTTCT | 1898.79 | 1856 | 0.977 | **-0.023** |
| SS | AGTTCA | 1535.06 | 1498 | 0.976 | **-0.024** |

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| --- | --- | --- | --- | --- | --- |
| SS | TCAAGT | 1535.06 | 1404 | 0.915 | **-0.089** |
| SS | AGCTCA | 2433.11 | 2075 | 0.853 | **-0.159** |
| SS | AGCTCT | 3009.63 | 2465 | 0.819 | **-0.200** |
| SS | TCTTCG | 702.47 | 556 | 0.791 | **-0.234** |
| SS | TCATCC | 2147.58 | 1632 | 0.760 | **-0.275** |
| SS | AGTAGT | 1560.21 | 1030 | 0.660 | **-0.415** |
| SS | AGTTCC | 2182.77 | 1405 | 0.644 | **-0.441** |
| SS | TCGTCT | 702.47 | 434 | 0.618 | **-0.482** |
| SS | TCATCG | 567.91 | 343 | 0.604 | **-0.504** |
| SS | TCGTCA | 567.91 | 313 | 0.551 | **-0.596** |
| SS | TCTAGT | 1898.79 | 957 | 0.504 | **-0.685** |
| SS | TCGAGC | 914.89 | 440 | 0.481 | **-0.732** |
| SS | AGTAGC | 2472.97 | 1158 | 0.468 | **-0.759** |
| SS | TCAAGC | 2433.11 | 1117 | 0.459 | **-0.779** |
| SS | TCGAGT | 577.21 | 259 | 0.449 | **-0.801** |
| SS | AGTTCG | 577.21 | 251 | 0.435 | **-0.833** |
| SS | TCTAGC | 3009.63 | 899 | 0.299 | **-1.208** |
| ST | TCCACG | 785.52 | 1434 | 1.826 | **0.602** |
| ST | AGCACC | 2709.18 | 4149 | 1.531 | **0.426** |
| ST | TCCACC | 2391.25 | 3527 | 1.475 | **0.389** |
| ST | AGCACG | 889.95 | 1180 | 1.326 | **0.282** |
| ST | AGCACA | 2193.18 | 2692 | 1.227 | **0.205** |
| ST | TCCACA | 1935.81 | 2329 | 1.203 | **0.185** |
| ST | TCCACT | 1711.89 | 1937 | 1.131 | **0.124** |
| ST | AGCACT | 1939.49 | 2193 | 1.131 | **0.123** |
| ST | TCAACA | 1361.39 | 1485 | 1.091 | **0.087** |
| ST | TCAACT | 1203.91 | 1270 | 1.055 | **0.053** |
| ST | TCTACT | 1489.18 | 1390 | 0.933 | **-0.069** |
| ST | TCTACA | 1683.97 | 1461 | 0.868 | **-0.142** |
| ST | AGTACT | 1223.64 | 1036 | 0.847 | **-0.166** |
| ST | AGTACA | 1383.69 | 1061 | 0.767 | **-0.266** |
| ST | TCGACG | 207.72 | 145 | 0.698 | **-0.359** |
| ST | TCTACC | 2080.15 | 1218 | 0.586 | **-0.535** |
| ST | TCGACC | 632.34 | 365 | 0.577 | **-0.550** |
| ST | AGTACC | 1709.24 | 976 | 0.571 | **-0.560** |
| ST | TCGACT | 452.69 | 240 | 0.530 | **-0.635** |
| ST | TCAACC | 1681.68 | 873 | 0.519 | **-0.656** |
| ST | TCAACG | 552.43 | 275 | 0.498 | **-0.698** |
| ST | TCGACA | 511.90 | 236 | 0.461 | **-0.774** |
| ST | TCTACG | 683.32 | 302 | 0.442 | **-0.817** |
| ST | AGTACG | 561.48 | 201 | 0.358 | **-1.027** |
| SV | TCGGTG | 935.47 | 1822 | 1.948 | **0.667** |
| SV | TCTGTA | 788.92 | 1398 | 1.772 | **0.572** |
| SV | TCTGTT | 1214.96 | 2136 | 1.758 | **0.564** |
| SV | TCAGTA | 637.79 | 1121 | 1.758 | **0.564** |
| SV | AGTGTT | 998.32 | 1719 | 1.722 | **0.543** |
| SV | TCAGTT | 982.23 | 1591 | 1.620 | **0.482** |
| SV | TCTGTC | 1555.54 | 2367 | 1.522 | **0.420** |
| SV | AGTGTC | 1278.17 | 1943 | 1.520 | **0.419** |
| SV | TCTGTG | 3077.33 | 4672 | 1.518 | **0.418** |
| SV | AGTGTA | 648.24 | 976 | 1.506 | **0.409** |
| SV | TCGGTC | 472.87 | 683 | 1.444 | **0.368** |
| SV | TCAGTG | 2487.84 | 2925 | 1.176 | **0.162** |

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| --- | --- | --- | --- | --- | --- |
| SV | AGTGTG | 2528.60 | 2901 | 1.147 | **0.137** |
| SV | TCAGTC | 1257.56 | 1351 | 1.074 | **0.072** |
| SV | TCGGTA | 239.82 | 231 | 0.963 | **-0.037** |
| SV | TCGGTT | 369.33 | 266 | 0.720 | **-0.328** |
| SV | AGCGTC | 2025.93 | 1298 | 0.641 | **-0.445** |
| SV | TCCGTG | 3537.57 | 2065 | 0.584 | **-0.538** |
| SV | AGCGTG | 4007.89 | 2221 | 0.554 | **-0.590** |
| SV | TCCGTC | 1788.18 | 829 | 0.464 | **-0.769** |
| SV | AGCGTT | 1582.36 | 446 | 0.282 | **-1.266** |
| SV | TCCGTA | 906.91 | 239 | 0.264 | **-1.334** |
| SV | TCCGTT | 1396.67 | 329 | 0.236 | **-1.446** |
| SV | AGCGTA | 1027.48 | 217 | 0.211 | **-1.555** |
| SW | TCCTGG | 1756.97 | 2825 | 1.608 | **0.475** |
| SW | AGCTGG | 1990.56 | 2404 | 1.208 | **0.189** |
| SW | TCGTGG | 464.61 | 444 | 0.956 | **-0.045** |
| SW | TCTTGG | 1528.39 | 1137 | 0.744 | **-0.296** |
| SW | TCATGG | 1235.61 | 778 | 0.630 | **-0.463** |
| SW | AGTTGG | 1255.86 | 644 | 0.513 | **-0.668** |
| SY | TCCTAC | 1871.53 | 3038 | 1.623 | **0.484** |
| SY | AGCTAC | 2120.35 | 2864 | 1.351 | **0.301** |
| SY | TCCTAT | 1520.75 | 1869 | 1.229 | **0.206** |
| SY | AGCTAT | 1722.94 | 1609 | 0.934 | **-0.068** |
| SY | AGTTAT | 1087.01 | 1010 | 0.929 | **-0.073** |
| SY | AGTTAC | 1337.74 | 1153 | 0.862 | **-0.149** |
| SY | TCATAT | 1069.49 | 897 | 0.839 | **-0.176** |
| SY | TCTTAT | 1322.91 | 1100 | 0.832 | **-0.185** |
| SY | TCTTAC | 1628.04 | 1204 | 0.740 | **-0.302** |
| SY | TCGTAC | 494.91 | 304 | 0.614 | **-0.487** |
| SY | TCGTAT | 402.15 | 204 | 0.507 | **-0.679** |
| SY | TCATAC | 1316.18 | 642 | 0.488 | **-0.718** |
| TA | ACGGCG | 348.71 | 734 | 2.105 | **0.744** |
| TA | ACAGCA | 1829.79 | 3283 | 1.794 | **0.585** |
| TA | ACGGCC | 1289.71 | 2090 | 1.621 | **0.483** |
| TA | ACTGCA | 1618.13 | 2557 | 1.580 | **0.458** |
| TA | ACAGCT | 2090.24 | 3295 | 1.576 | **0.455** |
| TA | ACTGCT | 1848.45 | 2764 | 1.495 | **0.402** |
| TA | ACAGCC | 3178.34 | 3912 | 1.231 | **0.208** |
| TA | ACGGCA | 742.49 | 804 | 1.083 | **0.080** |
| TA | ACTGCC | 2810.69 | 3015 | 1.073 | **0.070** |
| TA | ACGGCT | 848.18 | 804 | 0.948 | **-0.053** |
| TA | ACAGCG | 859.36 | 803 | 0.934 | **-0.068** |
| TA | ACTGCG | 759.96 | 623 | 0.820 | **-0.199** |
| TA | ACCGCG | 1061.55 | 584 | 0.550 | **-0.598** |
| TA | ACCGCC | 3926.11 | 1648 | 0.420 | **-0.868** |
| TA | ACCGCA | 2260.29 | 561 | 0.248 | **-1.394** |
| TA | ACCGCT | 2582.01 | 577 | 0.223 | **-1.498** |
| TC | ACCTGC | 1892.82 | 3247 | 1.715 | **0.540** |
| TC | ACCTGT | 1594.30 | 1994 | 1.251 | **0.224** |
| TC | ACGTGC | 621.78 | 691 | 1.111 | **0.106** |
| TC | ACGTGT | 523.72 | 484 | 0.924 | **-0.079** |
| TC | ACTTGT | 1141.35 | 1033 | 0.905 | **-0.100** |
| TC | ACATGT | 1290.64 | 938 | 0.727 | **-0.319** |
| TC | ACTTGC | 1355.07 | 815 | 0.601 | **-0.508** |

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| --- | --- | --- | --- | --- | --- |
| TC | ACATGC | 1532.31 | 750 | 0.489 | **-0.714** |
| TD | ACAGAT | 2415.25 | 4195 | 1.737 | **0.552** |
| TD | ACAGAC | 2728.31 | 3765 | 1.380 | **0.322** |
| TD | ACTGAT | 2135.87 | 2913 | 1.364 | **0.310** |
| TD | ACGGAC | 1107.10 | 1446 | 1.306 | **0.267** |
| TD | ACTGAC | 2412.71 | 2615 | 1.084 | **0.081** |
| TD | ACGGAT | 980.07 | 922 | 0.941 | **-0.061** |
| TD | ACCGAC | 3370.20 | 1547 | 0.459 | **-0.779** |
| TD | ACCGAT | 2983.49 | 730 | 0.245 | **-1.408** |
| TE | ACAGAA | 3127.33 | 5307 | 1.697 | **0.529** |
| TE | ACGGAG | 1697.07 | 2517 | 1.483 | **0.394** |
| TE | ACTGAA | 2765.58 | 4093 | 1.480 | **0.392** |
| TE | ACAGAG | 4182.23 | 5419 | 1.296 | **0.259** |
| TE | ACTGAG | 3698.46 | 4124 | 1.115 | **0.109** |
| TE | ACGGAA | 1269.01 | 1080 | 0.851 | **-0.161** |
| TE | ACCGAG | 5166.20 | 2450 | 0.474 | **-0.746** |
| TE | ACCGAA | 3863.10 | 779 | 0.202 | **-1.601** |
| TF | ACCTTC | 3026.54 | 4955 | 1.637 | **0.493** |
| TF | ACATTT | 2140.61 | 2275 | 1.063 | **0.061** |
| TF | ACTTTT | 1893.00 | 1904 | 1.006 | **0.006** |
| TF | ACCTTT | 2644.23 | 2518 | 0.952 | **-0.049** |
| TF | ACTTTC | 2166.69 | 1822 | 0.841 | **-0.173** |
| TF | ACGTTT | 868.62 | 650 | 0.748 | **-0.290** |
| TF | ACGTTC | 994.21 | 666 | 0.670 | **-0.401** |
| TF | ACATTC | 2450.10 | 1394 | 0.569 | **-0.564** |
| TG | ACTGGA | 1710.74 | 3660 | 2.139 | **0.761** |
| TG | ACTGGT | 1107.57 | 1887 | 1.704 | **0.533** |
| TG | ACAGGA | 1934.51 | 2970 | 1.535 | **0.429** |
| TG | ACGGGC | 1064.34 | 1583 | 1.487 | **0.397** |
| TG | ACTGGG | 1670.12 | 2322 | 1.390 | **0.330** |
| TG | ACGGGG | 766.35 | 1049 | 1.369 | **0.314** |
| TG | ACAGGT | 1252.44 | 1694 | 1.353 | **0.302** |
| TG | ACAGGG | 1888.57 | 2148 | 1.137 | **0.129** |
| TG | ACTGGC | 2319.53 | 2620 | 1.130 | **0.122** |
| TG | ACAGGC | 2622.93 | 2664 | 1.016 | **0.016** |
| TG | ACGGGT | 508.22 | 484 | 0.952 | **-0.049** |
| TG | ACGGGA | 784.99 | 710 | 0.904 | **-0.100** |
| TG | ACCGGG | 2332.90 | 1093 | 0.469 | **-0.758** |
| TG | ACCGGC | 3240.03 | 1373 | 0.424 | **-0.859** |
| TG | ACCGGT | 1547.11 | 355 | 0.229 | **-1.472** |
| TG | ACCGGA | 2389.65 | 528 | 0.221 | **-1.510** |
| TH | ACTCAT | 1054.95 | 1291 | 1.224 | **0.202** |
| TH | ACCCAC | 2032.09 | 2408 | 1.185 | **0.170** |
| TH | ACGCAC | 667.53 | 764 | 1.145 | **0.135** |
| TH | ACACAT | 1192.94 | 1186 | 0.994 | **-0.006** |
| TH | ACTCAC | 1454.76 | 1384 | 0.951 | **-0.050** |
| TH | ACCCAT | 1473.60 | 1287 | 0.873 | **-0.135** |
| TH | ACACAC | 1645.05 | 1383 | 0.841 | **-0.174** |
| TH | ACGCAT | 484.07 | 302 | 0.624 | **-0.472** |
| TI | ACCATC | 2842.70 | 5915 | 2.081 | **0.733** |
| TI | ACCATT | 2247.97 | 2878 | 1.280 | **0.247** |
| TI | ACAATA | 836.96 | 980 | 1.171 | **0.158** |
| TI | ACCATA | 1033.87 | 1137 | 1.100 | **0.095** |

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| --- | --- | --- | --- | --- | --- |
| TI | ACAATT | 1819.82 | 1579 | 0.868 | **-0.142** |
| TI | ACTATA | 740.14 | 642 | 0.867 | **-0.142** |
| TI | ACTATT | 1609.31 | 1337 | 0.831 | **-0.185** |
| TI | ACGATA | 339.62 | 190 | 0.559 | **-0.581** |
| TI | ACGATT | 738.45 | 389 | 0.527 | **-0.641** |
| TI | ACGATC | 933.81 | 463 | 0.496 | **-0.702** |
| TI | ACTATC | 2035.08 | 942 | 0.463 | **-0.770** |
| TI | ACAATC | 2301.27 | 1027 | 0.446 | **-0.807** |
| TK | ACCAAG | 3878.56 | 6678 | 1.722 | **0.543** |
| TK | ACCAAA | 2994.77 | 3789 | 1.265 | **0.235** |
| TK | ACAAAA | 2424.38 | 2546 | 1.050 | **0.049** |
| TK | ACAAAG | 3139.84 | 2507 | 0.798 | **-0.225** |
| TK | ACTAAA | 2143.95 | 1684 | 0.785 | **-0.241** |
| TK | ACGAAG | 1274.09 | 708 | 0.556 | **-0.588** |
| TK | ACGAAA | 983.77 | 511 | 0.519 | **-0.655** |
| TK | ACTAAG | 2776.65 | 1193 | 0.430 | **-0.845** |
| TL | ACGCTG | 1815.48 | 3357 | 1.849 | **0.615** |
| TL | ACTTTA | 765.72 | 1207 | 1.576 | **0.455** |
| TL | ACTTTG | 1286.34 | 1876 | 1.458 | **0.377** |
| TL | ACATTA | 865.87 | 1115 | 1.288 | **0.253** |
| TL | ACCTTG | 1796.82 | 2257 | 1.256 | **0.228** |
| TL | ACTCTA | 707.99 | 876 | 1.237 | **0.213** |
| TL | ACGCTC | 873.61 | 1057 | 1.210 | **0.191** |
| TL | ACCCTC | 2659.44 | 3133 | 1.178 | **0.164** |
| TL | ACCCTG | 5526.65 | 6354 | 1.150 | **0.140** |
| TL | ACTCTT | 1312.81 | 1469 | 1.119 | **0.112** |
| TL | ACACTA | 800.60 | 799 | 0.998 | **-0.002** |
| TL | ACGCTA | 324.87 | 307 | 0.945 | **-0.057** |
| TL | ACCTTA | 1069.59 | 957 | 0.895 | **-0.111** |
| TL | ACACTT | 1484.53 | 1316 | 0.886 | **-0.121** |
| TL | ACGTTG | 590.25 | 505 | 0.856 | **-0.156** |
| TL | ACATTG | 1454.60 | 1210 | 0.832 | **-0.184** |
| TL | ACCCTT | 1833.80 | 1515 | 0.826 | **-0.191** |
| TL | ACCCTA | 988.95 | 802 | 0.811 | **-0.210** |
| TL | ACTCTG | 3956.51 | 3120 | 0.789 | **-0.238** |
| TL | ACGTTA | 351.36 | 262 | 0.746 | **-0.293** |
| TL | ACTCTC | 1903.88 | 1391 | 0.731 | **-0.314** |
| TL | ACGCTT | 602.39 | 427 | 0.709 | **-0.344** |
| TL | ACACTG | 4474.03 | 3013 | 0.673 | **-0.395** |
| TL | ACACTC | 2152.92 | 1274 | 0.592 | **-0.525** |
| TM | ACCATG | 2733.42 | 4467 | 1.634 | **0.491** |
| TM | ACAATG | 2212.81 | 1641 | 0.742 | **-0.299** |
| TM | ACGATG | 897.92 | 655 | 0.729 | **-0.315** |
| TM | ACTATG | 1956.85 | 1038 | 0.530 | **-0.634** |
| TN | ACCAAC | 2378.62 | 4300 | 1.808 | **0.592** |
| TN | ACAAAT | 1748.34 | 2194 | 1.255 | **0.227** |
| TN | ACCAAT | 2159.68 | 2454 | 1.136 | **0.128** |
| TN | ACAAAC | 1925.59 | 1486 | 0.772 | **-0.259** |
| TN | ACTAAT | 1546.11 | 1077 | 0.697 | **-0.362** |
| TN | ACGAAT | 709.45 | 336 | 0.474 | **-0.747** |
| TN | ACTAAC | 1702.85 | 789 | 0.463 | **-0.769** |
| TN | ACGAAC | 781.37 | 316 | 0.404 | **-0.905** |
| TP | ACGCCG | 349.03 | 632 | 1.811 | **0.594** |

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| --- | --- | --- | --- | --- | --- |
| TP | ACGCCC | 963.29 | 1491 | 1.548 | **0.437** |
| TP | ACTCCA | 1814.66 | 2359 | 1.300 | **0.262** |
| TP | ACCCCG | 1062.52 | 1331 | 1.253 | **0.225** |
| TP | ACTCCT | 1880.23 | 2186 | 1.163 | **0.151** |
| TP | ACACCA | 2052.02 | 2361 | 1.151 | **0.140** |
| TP | ACCCCA | 2534.80 | 2784 | 1.098 | **0.094** |
| TP | ACACCT | 2126.17 | 2104 | 0.990 | **-0.010** |
| TP | ACCCCT | 2626.39 | 2415 | 0.920 | **-0.084** |
| TP | ACGCCA | 832.67 | 748 | 0.898 | **-0.107** |
| TP | ACCCCC | 2932.43 | 2380 | 0.812 | **-0.209** |
| TP | ACACCC | 2373.91 | 1922 | 0.810 | **-0.211** |
| TP | ACGCCT | 862.76 | 697 | 0.808 | **-0.213** |
| TP | ACTCCC | 2099.31 | 1649 | 0.785 | **-0.241** |
| TP | ACTCCG | 760.66 | 538 | 0.707 | **-0.346** |
| TP | ACACCG | 860.15 | 534 | 0.621 | **-0.477** |
| TQ | ACTCAA | 1103.35 | 1368 | 1.240 | **0.215** |
| TQ | ACCCAG | 4303.71 | 5173 | 1.202 | **0.184** |
| TQ | ACGCAG | 1413.75 | 1518 | 1.074 | **0.071** |
| TQ | ACACAA | 1247.67 | 1328 | 1.064 | **0.062** |
| TQ | ACTCAG | 3081.01 | 2839 | 0.921 | **-0.082** |
| TQ | ACCCAA | 1541.21 | 1410 | 0.915 | **-0.089** |
| TQ | ACACAG | 3484.02 | 2765 | 0.794 | **-0.231** |
| TQ | ACGCAA | 506.28 | 280 | 0.553 | **-0.592** |
| TR | ACCAGG | 1331.08 | 2049 | 1.539 | **0.431** |
| TR | ACGCGC | 403.79 | 605 | 1.498 | **0.404** |
| TR | ACGCGG | 441.63 | 661 | 1.497 | **0.403** |
| TR | ACTCGA | 521.72 | 717 | 1.374 | **0.318** |
| TR | ACAAGA | 1097.61 | 1429 | 1.302 | **0.264** |
| TR | ACCCGC | 1229.22 | 1547 | 1.259 | **0.230** |
| TR | ACCCGG | 1344.40 | 1668 | 1.241 | **0.216** |
| TR | ACTCGT | 376.76 | 448 | 1.189 | **0.173** |
| TR | ACCAGA | 1355.85 | 1599 | 1.179 | **0.165** |
| TR | ACCCGA | 728.77 | 758 | 1.040 | **0.039** |
| TR | ACCCGT | 526.27 | 535 | 1.017 | **0.016** |
| TR | ACAAGG | 1077.56 | 1072 | 0.995 | **-0.005** |
| TR | ACGAGG | 437.25 | 433 | 0.990 | **-0.010** |
| TR | ACTCGG | 962.45 | 823 | 0.855 | **-0.157** |
| TR | ACGCGT | 172.88 | 141 | 0.816 | **-0.204** |
| TR | ACACGT | 426.04 | 329 | 0.772 | **-0.258** |
| TR | ACGAGA | 445.39 | 331 | 0.743 | **-0.297** |
| TR | ACACGA | 589.97 | 432 | 0.732 | **-0.312** |
| TR | ACACGG | 1088.34 | 756 | 0.695 | **-0.364** |
| TR | ACTCGC | 879.99 | 607 | 0.690 | **-0.371** |
| TR | ACTAGA | 970.65 | 624 | 0.643 | **-0.442** |
| TR | ACGCGA | 239.40 | 150 | 0.627 | **-0.468** |
| TR | ACACGC | 995.10 | 498 | 0.500 | **-0.692** |
| TR | ACTAGG | 952.91 | 383 | 0.402 | **-0.911** |
| TS | ACCAGC | 2807.29 | 4575 | 1.630 | **0.488** |
| TS | ACCTCG | 655.24 | 1060 | 1.618 | **0.481** |
| TS | ACGTCG | 215.24 | 348 | 1.617 | **0.480** |
| TS | ACTTCA | 1247.51 | 1844 | 1.478 | **0.391** |
| TS | ACTTCT | 1543.11 | 1974 | 1.279 | **0.246** |
| TS | ACATCA | 1410.69 | 1754 | 1.243 | **0.218** |

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| --- | --- | --- | --- | --- | --- |
| TS | ACCAGT | 1771.14 | 2194 | 1.239 | **0.214** |
| TS | ACCTCC | 2477.85 | 3050 | 1.231 | **0.208** |
| TS | ACCTCA | 1742.59 | 1938 | 1.112 | **0.106** |
| TS | ACATCT | 1744.95 | 1911 | 1.095 | **0.091** |
| TS | ACGTCC | 813.96 | 840 | 1.032 | **0.031** |
| TS | ACCTCT | 2155.49 | 2072 | 0.961 | **-0.040** |
| TS | ACAAGT | 1433.80 | 1335 | 0.931 | **-0.071** |
| TS | ACTTCC | 1773.89 | 1524 | 0.859 | **-0.152** |
| TS | ACGTCA | 572.43 | 450 | 0.786 | **-0.241** |
| TS | ACATCC | 2005.92 | 1570 | 0.783 | **-0.245** |
| TS | ACTTCG | 469.09 | 353 | 0.753 | **-0.284** |
| TS | ACGTCT | 708.07 | 527 | 0.744 | **-0.295** |
| TS | ACATCG | 530.44 | 361 | 0.681 | **-0.385** |
| TS | ACTAGT | 1267.95 | 725 | 0.572 | **-0.559** |
| TS | ACAAGC | 2272.61 | 1275 | 0.561 | **-0.578** |
| TS | ACGAGT | 581.81 | 297 | 0.510 | **-0.672** |
| TS | ACGAGC | 922.18 | 469 | 0.509 | **-0.676** |
| TS | ACTAGC | 2009.73 | 687 | 0.342 | **-1.073** |
| TT | ACCACG | 875.88 | 1567 | 1.789 | **0.582** |
| TT | ACCACC | 2666.32 | 4767 | 1.788 | **0.581** |
| TT | ACCACA | 2158.49 | 2882 | 1.335 | **0.289** |
| TT | ACCACT | 1908.81 | 2309 | 1.210 | **0.190** |
| TT | ACAACA | 1747.38 | 1793 | 1.026 | **0.026** |
| TT | ACAACT | 1545.26 | 1567 | 1.014 | **0.014** |
| TT | ACGACG | 287.72 | 252 | 0.876 | **-0.133** |
| TT | ACTACT | 1366.51 | 1065 | 0.779 | **-0.249** |
| TT | ACTACA | 1545.26 | 1196 | 0.774 | **-0.256** |
| TT | ACGACC | 875.88 | 575 | 0.656 | **-0.421** |
| TT | ACGACA | 709.06 | 437 | 0.616 | **-0.484** |
| TT | ACAACC | 2158.49 | 1310 | 0.607 | **-0.499** |
| TT | ACGACT | 627.04 | 357 | 0.569 | **-0.563** |
| TT | ACTACC | 1908.81 | 992 | 0.520 | **-0.655** |
| TT | ACAACG | 709.06 | 365 | 0.515 | **-0.664** |
| TT | ACTACG | 627.04 | 283 | 0.451 | **-0.796** |
| TV | ACTGTA | 845.20 | 1425 | 1.686 | **0.522** |
| TV | ACTGTT | 1301.64 | 2058 | 1.581 | **0.458** |
| TV | ACGGTG | 1512.80 | 2306 | 1.524 | **0.422** |
| TV | ACAGTA | 955.76 | 1371 | 1.434 | **0.361** |
| TV | ACTGTC | 1666.51 | 2289 | 1.374 | **0.317** |
| TV | ACAGTT | 1471.90 | 2019 | 1.372 | **0.316** |
| TV | ACTGTG | 3296.87 | 4505 | 1.366 | **0.312** |
| TV | ACGGTC | 764.70 | 911 | 1.191 | **0.175** |
| TV | ACAGTG | 3728.11 | 4108 | 1.102 | **0.097** |
| TV | ACAGTC | 1884.50 | 1933 | 1.026 | **0.025** |
| TV | ACGGTA | 387.83 | 286 | 0.737 | **-0.305** |
| TV | ACGGTT | 597.27 | 415 | 0.695 | **-0.364** |
| TV | ACCGTG | 4605.23 | 2640 | 0.573 | **-0.556** |
| TV | ACCGTC | 2327.87 | 1285 | 0.552 | **-0.594** |
| TV | ACCGTT | 1818.19 | 496 | 0.273 | **-1.299** |
| TV | ACCGTA | 1180.62 | 298 | 0.252 | **-1.377** |
| TW | ACGTGG | 606.25 | 837 | 1.381 | **0.323** |
| TW | ACCTGG | 1845.52 | 2403 | 1.302 | **0.264** |
| TW | ACATGG | 1494.02 | 1089 | 0.729 | **-0.316** |

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| --- | --- | --- | --- | --- | --- |
| TW | ACTTGG | 1321.21 | 938 | 0.710 | **-0.343** |
| TY | ACCTAC | 2130.11 | 3648 | 1.713 | **0.538** |
| TY | ACCTAT | 1730.88 | 1778 | 1.027 | **0.027** |
| TY | ACTTAC | 1524.94 | 1383 | 0.907 | **-0.098** |
| TY | ACGTAC | 699.73 | 621 | 0.887 | **-0.119** |
| TY | ACATAT | 1401.21 | 1136 | 0.811 | **-0.210** |
| TY | ACTTAT | 1239.13 | 907 | 0.732 | **-0.312** |
| TY | ACGTAT | 568.59 | 408 | 0.718 | **-0.332** |
| TY | ACATAC | 1724.41 | 1138 | 0.660 | **-0.416** |
| VA | GTGGCC | 6082.92 | 9316 | 1.532 | **0.426** |
| VA | GTAGCA | 897.78 | 1347 | 1.500 | **0.406** |
| VA | GTTGCT | 1579.41 | 2217 | 1.404 | **0.339** |
| VA | GTAGCT | 1025.57 | 1407 | 1.372 | **0.316** |
| VA | GTGGCT | 4000.44 | 5252 | 1.313 | **0.272** |
| VA | GTGGCG | 1644.71 | 2099 | 1.276 | **0.244** |
| VA | GTTGCA | 1382.62 | 1728 | 1.250 | **0.223** |
| VA | GTGGCA | 3501.98 | 3859 | 1.102 | **0.097** |
| VA | GTAGCC | 1559.44 | 1363 | 0.874 | **-0.135** |
| VA | GTTGCC | 2401.60 | 1808 | 0.753 | **-0.284** |
| VA | GTAGCG | 421.64 | 216 | 0.512 | **-0.669** |
| VA | GTTGCG | 649.35 | 234 | 0.360 | **-1.021** |
| VA | GTCGCG | 831.37 | 284 | 0.342 | **-1.074** |
| VA | GTCGCC | 3074.82 | 992 | 0.323 | **-1.131** |
| VA | GTCGCT | 2022.16 | 406 | 0.201 | **-1.606** |
| VA | GTCGCA | 1770.19 | 318 | 0.180 | **-1.717** |
| VC | GTCTGC | 1410.66 | 2160 | 1.531 | **0.426** |
| VC | GTCTGT | 1188.18 | 1572 | 1.323 | **0.280** |
| VC | GTTTGT | 928.03 | 942 | 1.015 | **0.015** |
| VC | GTATGT | 602.60 | 594 | 0.986 | **-0.014** |
| VC | GTGTGC | 2790.71 | 2583 | 0.926 | **-0.077** |
| VC | GTGTGT | 2350.57 | 1996 | 0.849 | **-0.164** |
| VC | GTTTGC | 1101.80 | 830 | 0.753 | **-0.283** |
| VC | GTATGC | 715.44 | 411 | 0.574 | **-0.554** |
| VD | GTAGAT | 1225.65 | 1924 | 1.570 | **0.451** |
| VD | GTGGAC | 5400.58 | 7734 | 1.432 | **0.359** |
| VD | GTTGAT | 1887.55 | 2389 | 1.266 | **0.236** |
| VD | GTGGAT | 4780.91 | 5727 | 1.198 | **0.181** |
| VD | GTAGAC | 1384.52 | 1346 | 0.972 | **-0.028** |
| VD | GTTGAC | 2132.21 | 1791 | 0.840 | **-0.174** |
| VD | GTCGAC | 2729.91 | 602 | 0.221 | **-1.512** |
| VD | GTCGAT | 2416.67 | 445 | 0.184 | **-1.692** |
| VE | GTAGAA | 1456.83 | 2855 | 1.960 | **0.673** |
| VE | GTGGAG | 7599.48 | 11579 | 1.524 | **0.421** |
| VE | GTTGAA | 2243.56 | 2905 | 1.295 | **0.258** |
| VE | GTGGAA | 5682.64 | 6229 | 1.096 | **0.092** |
| VE | GTAGAG | 1948.24 | 2002 | 1.028 | **0.027** |
| VE | GTTGAG | 3000.36 | 1987 | 0.662 | **-0.412** |
| VE | GTCGAG | 3841.42 | 721 | 0.188 | **-1.673** |
| VE | GTCGAA | 2872.48 | 367 | 0.128 | **-2.058** |
| VF | GTCTTC | 2309.08 | 4216 | 1.826 | **0.602** |
| VF | GTATTT | 1023.16 | 1512 | 1.478 | **0.391** |
| VF | GTCTTT | 2017.40 | 2238 | 1.109 | **0.104** |
| VF | GTTTTT | 1575.70 | 1706 | 1.083 | **0.079** |

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| --- | --- | --- | --- | --- | --- |
| VF | GTTTTC | 1803.52 | 1604 | 0.889 | **-0.117** |
| VF | GTGTTT | 3991.02 | 3257 | 0.816 | **-0.203** |
| VF | GTGTTC | 4568.05 | 3205 | 0.702 | **-0.354** |
| VF | GTATTC | 1171.09 | 721 | 0.616 | **-0.485** |
| VG | GTTGGT | 779.74 | 1617 | 2.074 | **0.729** |
| VG | GTTGGA | 1204.37 | 2315 | 1.922 | **0.653** |
| VG | GTGGGC | 4136.07 | 5977 | 1.445 | **0.368** |
| VG | GTAGGA | 782.04 | 1089 | 1.393 | **0.331** |
| VG | GTTGGG | 1175.77 | 1510 | 1.284 | **0.250** |
| VG | GTTGGC | 1632.96 | 1794 | 1.099 | **0.094** |
| VG | GTAGGT | 506.31 | 554 | 1.094 | **0.090** |
| VG | GTGGGG | 2978.07 | 3255 | 1.093 | **0.089** |
| VG | GTGGGT | 1974.96 | 2009 | 1.017 | **0.017** |
| VG | GTAGGG | 763.47 | 683 | 0.895 | **-0.111** |
| VG | GTGGGA | 3050.51 | 2599 | 0.852 | **-0.160** |
| VG | GTAGGC | 1060.34 | 676 | 0.638 | **-0.450** |
| VG | GTCGGG | 1505.36 | 734 | 0.488 | **-0.718** |
| VG | GTCGGC | 2090.72 | 734 | 0.351 | **-1.047** |
| VG | GTCGGT | 998.31 | 292 | 0.292 | **-1.229** |
| VG | GTCGGA | 1541.98 | 343 | 0.222 | **-1.503** |
| VH | GTTCAT | 911.79 | 1418 | 1.555 | **0.442** |
| VH | GTACAT | 592.06 | 773 | 1.306 | **0.267** |
| VH | GTCCAC | 1609.82 | 2085 | 1.295 | **0.259** |
| VH | GTCCAT | 1167.39 | 1313 | 1.125 | **0.118** |
| VH | GTTCAC | 1257.35 | 1319 | 1.049 | **0.048** |
| VH | GTGCAC | 3184.70 | 2856 | 0.897 | **-0.109** |
| VH | GTACAC | 816.44 | 613 | 0.751 | **-0.287** |
| VH | GTGCAT | 2309.44 | 1472 | 0.637 | **-0.450** |
| VI | GTCATC | 2367.78 | 5207 | 2.199 | **0.788** |
| VI | GTCATT | 1872.41 | 2827 | 1.510 | **0.412** |
| VI | GTAATA | 436.74 | 614 | 1.406 | **0.341** |
| VI | GTAATT | 949.63 | 1074 | 1.131 | **0.123** |
| VI | GTTATT | 1462.46 | 1595 | 1.091 | **0.087** |
| VI | GTCATA | 861.15 | 904 | 1.050 | **0.049** |
| VI | GTTATA | 672.60 | 702 | 1.044 | **0.043** |
| VI | GTGATT | 3704.20 | 2742 | 0.740 | **-0.301** |
| VI | GTGATC | 4684.19 | 3353 | 0.716 | **-0.334** |
| VI | GTGATA | 1703.61 | 1117 | 0.656 | **-0.422** |
| VI | GTTATC | 1849.37 | 1053 | 0.569 | **-0.563** |
| VI | GTAATC | 1200.86 | 577 | 0.480 | **-0.733** |
| VK | GTAAAA | 1288.46 | 1945 | 1.510 | **0.412** |
| VK | GTCAAG | 3290.24 | 3982 | 1.210 | **0.191** |
| VK | GTGAAG | 6509.08 | 7513 | 1.154 | **0.143** |
| VK | GTAAAG | 1668.70 | 1704 | 1.021 | **0.021** |
| VK | GTCAAA | 2540.51 | 2376 | 0.935 | **-0.067** |
| VK | GTTAAA | 1984.27 | 1777 | 0.896 | **-0.110** |
| VK | GTGAAA | 5025.89 | 4409 | 0.877 | **-0.131** |
| VK | GTTAAG | 2569.85 | 1171 | 0.456 | **-0.786** |
| VL | GTTTTA | 668.83 | 1311 | 1.960 | **0.673** |
| VL | GTTCTT | 1146.70 | 1859 | 1.621 | **0.483** |
| VL | GTTTTG | 1123.58 | 1737 | 1.546 | **0.436** |
| VL | GTATTA | 434.30 | 646 | 1.487 | **0.397** |
| VL | GTCCTC | 2129.16 | 3019 | 1.418 | **0.349** |

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| --- | --- | --- | --- | --- | --- |
| VL | GTTCTA | 618.41 | 832 | 1.345 | **0.297** |
| VL | GTCCTG | 4424.65 | 5574 | 1.260 | **0.231** |
| VL | GTCCTT | 1468.14 | 1722 | 1.173 | **0.159** |
| VL | GTGCTG | 8753.31 | 10107 | 1.155 | **0.144** |
| VL | GTCTTG | 1438.54 | 1628 | 1.132 | **0.124** |
| VL | GTACTA | 401.55 | 447 | 1.113 | **0.107** |
| VL | GTCCTA | 791.76 | 874 | 1.104 | **0.099** |
| VL | GTCTTA | 856.32 | 863 | 1.008 | **0.008** |
| VL | GTATTG | 729.58 | 711 | 0.975 | **-0.026** |
| VL | GTACTT | 744.59 | 693 | 0.931 | **-0.072** |
| VL | GTTCTC | 1662.99 | 1501 | 0.903 | **-0.102** |
| VL | GTGCTC | 4212.12 | 3765 | 0.894 | **-0.112** |
| VL | GTGCTA | 1566.34 | 1286 | 0.821 | **-0.197** |
| VL | GTTCTG | 3455.90 | 2350 | 0.680 | **-0.386** |
| VL | GTGTTG | 2845.87 | 1910 | 0.671 | **-0.399** |
| VL | GTGCTT | 2904.43 | 1933 | 0.666 | **-0.407** |
| VL | GTGTTA | 1694.06 | 965 | 0.570 | **-0.563** |
| VL | GTACTC | 1079.84 | 541 | 0.501 | **-0.691** |
| VL | GTACTG | 2244.04 | 1121 | 0.500 | **-0.694** |
| VM | GTCATG | 2149.52 | 3308 | 1.539 | **0.431** |
| VM | GTGATG | 4252.41 | 3872 | 0.911 | **-0.094** |
| VM | GTAATG | 1090.17 | 935 | 0.858 | **-0.154** |
| VM | GTTATG | 1678.90 | 1056 | 0.629 | **-0.464** |
| VN | GTCAAC | 2052.00 | 3311 | 1.614 | **0.478** |
| VN | GTAAAT | 944.92 | 1518 | 1.606 | **0.474** |
| VN | GTCAAT | 1863.13 | 2155 | 1.157 | **0.146** |
| VN | GTTAAT | 1455.20 | 1325 | 0.911 | **-0.094** |
| VN | GTGAAC | 4059.49 | 3551 | 0.875 | **-0.134** |
| VN | GTGAAT | 3685.83 | 3110 | 0.844 | **-0.170** |
| VN | GTAAAC | 1040.71 | 854 | 0.821 | **-0.198** |
| VN | GTTAAC | 1602.73 | 880 | 0.549 | **-0.600** |
| VP | GTTCCT | 1434.04 | 2257 | 1.574 | **0.454** |
| VP | GTTCCA | 1384.03 | 1911 | 1.381 | **0.323** |
| VP | GTGCCC | 4055.45 | 4998 | 1.232 | **0.209** |
| VP | GTACCT | 931.17 | 1048 | 1.125 | **0.118** |
| VP | GTCCCC | 2049.96 | 2260 | 1.102 | **0.098** |
| VP | GTCCCT | 1836.02 | 2014 | 1.097 | **0.093** |
| VP | GTACCA | 898.70 | 963 | 1.072 | **0.069** |
| VP | GTCCCG | 742.77 | 786 | 1.058 | **0.057** |
| VP | GTTCCC | 1601.13 | 1506 | 0.941 | **-0.061** |
| VP | GTCCCA | 1772.00 | 1596 | 0.901 | **-0.105** |
| VP | GTGCCT | 3632.21 | 3062 | 0.843 | **-0.171** |
| VP | GTGCCG | 1469.43 | 1228 | 0.836 | **-0.179** |
| VP | GTACCC | 1039.67 | 809 | 0.778 | **-0.251** |
| VP | GTGCCA | 3505.55 | 2431 | 0.693 | **-0.366** |
| VP | GTTCCG | 580.15 | 279 | 0.481 | **-0.732** |
| VP | GTACCG | 376.71 | 161 | 0.427 | **-0.850** |
| VQ | GTACAA | 633.37 | 1049 | 1.656 | **0.505** |
| VQ | GTTCAA | 975.42 | 1485 | 1.522 | **0.420** |
| VQ | GTCCAG | 3487.32 | 3907 | 1.120 | **0.114** |
| VQ | GTACAG | 1768.65 | 1752 | 0.991 | **-0.009** |
| VQ | GTTCAG | 2723.79 | 2689 | 0.987 | **-0.013** |
| VQ | GTGCAG | 6898.98 | 6734 | 0.976 | **-0.024** |

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| --- | --- | --- | --- | --- | --- |
| VQ | GTCCAA | 1248.85 | 1067 | 0.854 | **-0.157** |
| VQ | GTGCAA | 2470.60 | 1524 | 0.617 | **-0.483** |
| VR | GTTCGA | 463.33 | 867 | 1.871 | **0.627** |
| VR | GTTCGT | 334.59 | 580 | 1.733 | **0.550** |
| VR | GTCCGA | 593.21 | 805 | 1.357 | **0.305** |
| VR | GTCCGC | 1000.57 | 1332 | 1.331 | **0.286** |
| VR | GTGCGC | 1979.43 | 2543 | 1.285 | **0.251** |
| VR | GTCCGT | 428.38 | 549 | 1.282 | **0.248** |
| VR | GTCCGG | 1094.32 | 1346 | 1.230 | **0.207** |
| VR | GTACGA | 300.86 | 361 | 1.200 | **0.182** |
| VR | GTAAGA | 559.73 | 660 | 1.179 | **0.165** |
| VR | GTGCGG | 2164.91 | 2552 | 1.179 | **0.164** |
| VR | GTCAGA | 1103.65 | 1291 | 1.170 | **0.157** |
| VR | GTACGT | 217.26 | 253 | 1.165 | **0.152** |
| VR | GTCAGG | 1083.48 | 1238 | 1.143 | **0.133** |
| VR | GTGAGG | 2143.46 | 1986 | 0.927 | **-0.076** |
| VR | GTGCGT | 847.46 | 761 | 0.898 | **-0.108** |
| VR | GTAAGG | 549.51 | 444 | 0.808 | **-0.213** |
| VR | GTTCGG | 854.73 | 650 | 0.760 | **-0.274** |
| VR | GTGCGA | 1173.55 | 826 | 0.704 | **-0.351** |
| VR | GTTCGC | 781.50 | 545 | 0.697 | **-0.360** |
| VR | GTGAGA | 2183.35 | 1511 | 0.692 | **-0.368** |
| VR | GTACGG | 555.00 | 377 | 0.679 | **-0.387** |
| VR | GTTAGA | 862.01 | 556 | 0.645 | **-0.438** |
| VR | GTACGC | 507.46 | 286 | 0.564 | **-0.573** |
| VR | GTTAGG | 846.26 | 309 | 0.365 | **-1.007** |
| VS | GTTTCT | 1206.81 | 2161 | 1.791 | **0.583** |
| VS | GTCTCC | 1776.18 | 2936 | 1.653 | **0.503** |
| VS | GTCAGC | 2012.32 | 3223 | 1.602 | **0.471** |
| VS | GTTTCA | 975.63 | 1465 | 1.502 | **0.407** |
| VS | GTCAGT | 1269.59 | 1841 | 1.450 | **0.372** |
| VS | GTATCT | 783.62 | 1093 | 1.395 | **0.333** |
| VS | GTATCA | 633.51 | 806 | 1.272 | **0.241** |
| VS | GTCTCT | 1545.10 | 1847 | 1.195 | **0.178** |
| VS | GTTTCC | 1387.29 | 1604 | 1.156 | **0.145** |
| VS | GTCTCG | 469.69 | 542 | 1.154 | **0.143** |
| VS | GTCTCA | 1249.12 | 1333 | 1.067 | **0.065** |
| VS | GTGTCC | 3513.81 | 3722 | 1.059 | **0.058** |
| VS | GTGTCG | 929.19 | 860 | 0.926 | **-0.077** |
| VS | GTGTCT | 3056.67 | 2784 | 0.911 | **-0.093** |
| VS | GTATCC | 900.82 | 763 | 0.847 | **-0.166** |
| VS | GTAAGT | 643.89 | 499 | 0.775 | **-0.255** |
| VS | GTGAGC | 3980.98 | 2901 | 0.729 | **-0.316** |
| VS | GTGTCA | 2471.14 | 1710 | 0.692 | **-0.368** |
| VS | GTTAGT | 991.62 | 640 | 0.645 | **-0.438** |
| VS | GTATCG | 238.21 | 138 | 0.579 | **-0.546** |
| VS | GTTTCG | 366.85 | 202 | 0.551 | **-0.597** |
| VS | GTGAGT | 2511.63 | 1371 | 0.546 | **-0.605** |
| VS | GTAAGC | 1020.58 | 514 | 0.504 | **-0.686** |
| VS | GTTAGC | 1571.73 | 551 | 0.351 | **-1.048** |
| VT | GTCACC | 2294.69 | 4477 | 1.951 | **0.668** |
| VT | GTCACT | 1642.76 | 2452 | 1.493 | **0.401** |
| VT | GTCACG | 753.80 | 997 | 1.323 | **0.280** |

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| --- | --- | --- | --- | --- | --- |
| VT | GTAACT | 833.15 | 1046 | 1.255 | **0.228** |
| VT | GTCACA | 1857.64 | 2207 | 1.188 | **0.172** |
| VT | GTAACA | 942.13 | 1096 | 1.163 | **0.151** |
| VT | GTTACT | 1283.09 | 1208 | 0.941 | **-0.060** |
| VT | GTGACC | 4539.59 | 4223 | 0.930 | **-0.072** |
| VT | GTGACG | 1491.24 | 1318 | 0.884 | **-0.123** |
| VT | GTGACT | 3249.88 | 2758 | 0.849 | **-0.164** |
| VT | GTGACA | 3674.98 | 2947 | 0.802 | **-0.221** |
| VT | GTTACA | 1450.92 | 1111 | 0.766 | **-0.267** |
| VT | GTAACC | 1163.79 | 758 | 0.651 | **-0.429** |
| VT | GTTACC | 1792.28 | 969 | 0.541 | **-0.615** |
| VT | GTAACG | 382.30 | 191 | 0.500 | **-0.694** |
| VT | GTTACG | 588.76 | 183 | 0.311 | **-1.169** |
| VV | GTTGTA | 655.54 | 1109 | 1.692 | **0.526** |
| VV | GTTGTT | 1009.55 | 1701 | 1.685 | **0.522** |
| VV | GTAGTA | 425.66 | 698 | 1.640 | **0.495** |
| VV | GTGGTG | 6476.64 | 9025 | 1.393 | **0.332** |
| VV | GTGGTC | 3273.84 | 4256 | 1.300 | **0.262** |
| VV | GTAGTT | 655.54 | 800 | 1.220 | **0.199** |
| VV | GTTGTC | 1292.55 | 1561 | 1.208 | **0.189** |
| VV | GTGGTA | 1660.38 | 1777 | 1.070 | **0.068** |
| VV | GTGGTT | 2557.05 | 2613 | 1.022 | **0.022** |
| VV | GTTGTG | 2557.05 | 2261 | 0.884 | **-0.123** |
| VV | GTAGTG | 1660.38 | 1161 | 0.699 | **-0.358** |
| VV | GTAGTC | 839.30 | 553 | 0.659 | **-0.417** |
| VV | GTCGTC | 1654.87 | 858 | 0.518 | **-0.657** |
| VV | GTCGTG | 3273.84 | 1250 | 0.382 | **-0.963** |
| VV | GTCGTA | 839.30 | 213 | 0.254 | **-1.371** |
| VV | GTCGTT | 1292.55 | 288 | 0.223 | **-1.501** |
| VW | GTCTGG | 1316.29 | 1763 | 1.339 | **0.292** |
| VW | GTGTGG | 2604.03 | 2451 | 0.941 | **-0.061** |
| VW | GTATGG | 667.58 | 578 | 0.866 | **-0.144** |
| VW | GTTTGG | 1028.10 | 824 | 0.801 | **-0.221** |
| VY | GTCTAC | 1602.79 | 2490 | 1.554 | **0.441** |
| VY | GTTTAT | 1017.23 | 1438 | 1.414 | **0.346** |
| VY | GTATAT | 660.53 | 875 | 1.325 | **0.281** |
| VY | GTCTAT | 1302.39 | 1544 | 1.186 | **0.170** |
| VY | GTGTAC | 3170.80 | 2654 | 0.837 | **-0.178** |
| VY | GTTTAC | 1251.87 | 1008 | 0.805 | **-0.217** |
| VY | GTATAC | 812.88 | 582 | 0.716 | **-0.334** |
| VY | GTGTAT | 2576.51 | 1804 | 0.700 | **-0.356** |
| WA | TGGGCA | 1469.77 | 1535 | 1.044 | **0.043** |
| WA | TGGGCG | 690.28 | 695 | 1.007 | **0.007** |
| WA | TGGGCT | 1678.97 | 1664 | 0.991 | **-0.009** |
| WA | TGGGCC | 2552.98 | 2498 | 0.978 | **-0.022** |
| WC | TGGTGC | 1057.38 | 1066 | 1.008 | **0.008** |
| WC | TGGTGT | 890.62 | 882 | 0.990 | **-0.010** |
| WD | TGGGAC | 2699.37 | 2807 | 1.040 | **0.039** |
| WD | TGGGAT | 2389.63 | 2282 | 0.955 | **-0.046** |
| WE | TGGGAG | 3580.00 | 3650 | 1.020 | **0.019** |
| WE | TGGGAA | 2677.00 | 2607 | 0.974 | **-0.026** |
| WF | TGGTTT | 1639.95 | 1735 | 1.058 | **0.056** |
| WF | TGGTTC | 1877.05 | 1782 | 0.949 | **-0.052** |

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| --- | --- | --- | --- | --- | --- |
| WG | TGGGGT | 955.95 | 1064 | 1.113 | **0.107** |
| WG | TGGGGC | 2002.00 | 2179 | 1.088 | **0.085** |
| WG | TGGGGA | 1476.56 | 1454 | 0.985 | **-0.015** |
| WG | TGGGGG | 1441.49 | 1179 | 0.818 | **-0.201** |
| WH | TGGCAT | 971.42 | 1000 | 1.029 | **0.029** |
| WH | TGGCAC | 1339.58 | 1311 | 0.979 | **-0.022** |
| WI | TGGATT | 1537.91 | 1627 | 1.058 | **0.056** |
| WI | TGGATA | 707.30 | 714 | 1.009 | **0.009** |
| WI | TGGATC | 1944.78 | 1849 | 0.951 | **-0.051** |
| WK | TGGAAG | 3491.83 | 3645 | 1.044 | **0.043** |
| WK | TGGAAA | 2696.17 | 2543 | 0.943 | **-0.058** |
| WL | TGGCTA | 683.88 | 798 | 1.167 | **0.154** |
| WL | TGGCTG | 3821.78 | 4228 | 1.106 | **0.101** |
| WL | TGGCTT | 1268.11 | 1334 | 1.052 | **0.051** |
| WL | TGGCTC | 1839.05 | 1879 | 1.022 | **0.021** |
| WL | TGGTTG | 1242.54 | 855 | 0.688 | **-0.374** |
| WL | TGGTTA | 739.64 | 501 | 0.677 | **-0.390** |
| WM | TGGATG | 2335.00 | 2335 | 1.000 | **0.000** |
| WN | TGGAAT | 1978.70 | 2005 | 1.013 | **0.013** |
| WN | TGGAAC | 2179.30 | 2153 | 0.988 | **-0.012** |
| WP | TGGCCC | 1302.21 | 1381 | 1.061 | **0.059** |
| WP | TGGCCG | 471.84 | 486 | 1.030 | **0.030** |
| WP | TGGCCA | 1125.64 | 1123 | 0.998 | **-0.002** |
| WP | TGGCCT | 1166.31 | 1076 | 0.923 | **-0.081** |
| WQ | TGGCAG | 2983.56 | 2997 | 1.005 | **0.004** |
| WQ | TGGCAA | 1068.44 | 1055 | 0.987 | **-0.013** |
| WR | TGGAGG | 1198.99 | 1665 | 1.389 | **0.328** |
| WR | TGGAGA | 1221.30 | 1472 | 1.205 | **0.187** |
| WR | TGGCGG | 1210.98 | 979 | 0.808 | **-0.213** |
| WR | TGGCGC | 1107.23 | 895 | 0.808 | **-0.213** |
| WR | TGGCGT | 474.05 | 377 | 0.795 | **-0.229** |
| WR | TGGCGA | 656.45 | 481 | 0.733 | **-0.311** |
| WS | TGGAGT | 1031.75 | 1239 | 1.201 | **0.183** |
| WS | TGGAGC | 1635.35 | 1956 | 1.196 | **0.179** |
| WS | TGGTCA | 1015.12 | 898 | 0.885 | **-0.123** |
| WS | TGGTCC | 1443.44 | 1271 | 0.881 | **-0.127** |
| WS | TGGTCT | 1255.65 | 1076 | 0.857 | **-0.154** |
| WS | TGGTCG | 381.70 | 323 | 0.846 | **-0.167** |
| WT | TGGACG | 598.07 | 674 | 1.127 | **0.120** |
| WT | TGGACA | 1473.88 | 1559 | 1.058 | **0.056** |
| WT | TGGACT | 1303.39 | 1240 | 0.951 | **-0.050** |
| WT | TGGACC | 1820.65 | 1723 | 0.946 | **-0.055** |
| WV | TGGGTC | 1318.64 | 1378 | 1.045 | **0.044** |
| WV | TGGGTG | 2608.66 | 2633 | 1.009 | **0.009** |
| WV | TGGGTA | 668.77 | 665 | 0.994 | **-0.006** |
| WV | TGGGTT | 1029.93 | 950 | 0.922 | **-0.081** |
| WW | TGGTGG | 1559.00 | 1559 | 1.000 | **0.000** |
| WY | TGGTAC | 1444.91 | 1520 | 1.052 | **0.051** |
| WY | TGGTAT | 1174.09 | 1099 | 0.936 | **-0.066** |
| YA | TATGCA | 1120.39 | 2249 | 2.007 | **0.697** |
| YA | TATGCT | 1279.86 | 2296 | 1.794 | **0.584** |
| YA | TATGCC | 1946.11 | 2862 | 1.471 | **0.386** |
| YA | TACGCG | 647.56 | 622 | 0.961 | **-0.040** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| YA | TATGCG | 526.19 | 482 | 0.916 | **-0.088** |
| YA | TACGCC | 2395.00 | 1402 | 0.585 | **-0.535** |
| YA | TACGCA | 1378.81 | 512 | 0.371 | **-0.991** |
| YA | TACGCT | 1575.07 | 444 | 0.282 | **-1.266** |
| YC | TACTGC | 1588.07 | 2411 | 1.518 | **0.418** |
| YC | TACTGT | 1337.61 | 1587 | 1.186 | **0.171** |
| YC | TATTGT | 1086.90 | 659 | 0.606 | **-0.500** |
| YC | TATTGC | 1290.42 | 646 | 0.501 | **-0.692** |
| YD | TATGAT | 2091.17 | 3707 | 1.773 | **0.572** |
| YD | TATGAC | 2362.22 | 3731 | 1.579 | **0.457** |
| YD | TACGAC | 2907.08 | 1653 | 0.569 | **-0.565** |
| YD | TACGAT | 2573.52 | 843 | 0.328 | **-1.116** |
| YE | TATGAA | 2515.85 | 5225 | 2.077 | **0.731** |
| YE | TATGAG | 3364.48 | 4722 | 1.403 | **0.339** |
| YE | TACGAG | 4140.53 | 2309 | 0.558 | **-0.584** |
| YE | TACGAA | 3096.14 | 861 | 0.278 | **-1.280** |
| YF | TACTTC | 2766.63 | 3380 | 1.222 | **0.200** |
| YF | TATTTT | 1964.12 | 2124 | 1.081 | **0.078** |
| YF | TACTTT | 2417.16 | 2201 | 0.911 | **-0.094** |
| YF | TATTTC | 2248.09 | 1691 | 0.752 | **-0.285** |
| YG | TATGGA | 1472.35 | 2874 | 1.952 | **0.669** |
| YG | TATGGT | 953.23 | 1665 | 1.747 | **0.558** |
| YG | TATGGG | 1437.38 | 2129 | 1.481 | **0.393** |
| YG | TATGGC | 1996.30 | 2749 | 1.377 | **0.320** |
| YG | TACGGG | 1768.93 | 1088 | 0.615 | **-0.486** |
| YG | TACGGC | 2456.76 | 1484 | 0.604 | **-0.504** |
| YG | TACGGT | 1173.10 | 448 | 0.382 | **-0.963** |
| YG | TACGGA | 1811.96 | 633 | 0.349 | **-1.052** |
| YH | TACCAC | 1862.81 | 2378 | 1.277 | **0.244** |
| YH | TACCAT | 1350.85 | 1420 | 1.051 | **0.050** |
| YH | TATCAT | 1097.67 | 1021 | 0.930 | **-0.072** |
| YH | TATCAC | 1513.67 | 1006 | 0.665 | **-0.409** |
| YI | TACATC | 2684.66 | 3935 | 1.466 | **0.382** |
| YI | TACATT | 2122.99 | 2162 | 1.018 | **0.018** |
| YI | TATATT | 1725.09 | 1554 | 0.901 | **-0.104** |
| YI | TACATA | 976.39 | 846 | 0.866 | **-0.143** |
| YI | TATATA | 793.39 | 648 | 0.817 | **-0.202** |
| YI | TATATC | 2181.48 | 1339 | 0.614 | **-0.488** |
| YK | TACAAG | 3508.58 | 4372 | 1.246 | **0.220** |
| YK | TACAAA | 2709.10 | 2847 | 1.051 | **0.050** |
| YK | TATAAA | 2201.34 | 2262 | 1.028 | **0.027** |
| YK | TATAAG | 2850.98 | 1789 | 0.628 | **-0.466** |
| YL | TACCTG | 4522.42 | 6324 | 1.398 | **0.335** |
| YL | TATTTA | 711.20 | 966 | 1.358 | **0.306** |
| YL | TACCTC | 2176.20 | 2598 | 1.194 | **0.177** |
| YL | TACTTG | 1470.33 | 1701 | 1.157 | **0.146** |
| YL | TATTTG | 1194.75 | 1358 | 1.137 | **0.128** |
| YL | TACCTA | 809.25 | 876 | 1.082 | **0.079** |
| YL | TACCTT | 1500.58 | 1449 | 0.966 | **-0.035** |
| YL | TATCTT | 1219.33 | 1166 | 0.956 | **-0.045** |
| YL | TACTTA | 875.24 | 763 | 0.872 | **-0.137** |
| YL | TATCTA | 657.58 | 541 | 0.823 | **-0.195** |
| YL | TATCTC | 1768.32 | 1087 | 0.615 | **-0.487** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| YL | TATCTG | 3674.80 | 1751 | 0.476 | **-0.741** |
| YM | TACATG | 2325.97 | 3055 | 1.313 | **0.273** |
| YM | TATATG | 1890.03 | 1161 | 0.614 | **-0.487** |
| YN | TACAAC | 2442.24 | 3341 | 1.368 | **0.313** |
| YN | TACAAT | 2217.44 | 2200 | 0.992 | **-0.008** |
| YN | TATAAT | 1801.83 | 1629 | 0.904 | **-0.101** |
| YN | TATAAC | 1984.50 | 1276 | 0.643 | **-0.442** |
| YP | TACCCG | 668.65 | 1004 | 1.502 | **0.406** |
| YP | TACCCA | 1595.15 | 1925 | 1.207 | **0.188** |
| YP | TATCCA | 1296.18 | 1438 | 1.109 | **0.104** |
| YP | TACCCC | 1845.38 | 1961 | 1.063 | **0.061** |
| YP | TATCCT | 1343.02 | 1379 | 1.027 | **0.026** |
| YP | TACCCT | 1652.79 | 1558 | 0.943 | **-0.059** |
| YP | TATCCC | 1499.51 | 937 | 0.625 | **-0.470** |
| YP | TATCCG | 543.32 | 242 | 0.445 | **-0.809** |
| YQ | TACCAG | 3987.12 | 5013 | 1.257 | **0.229** |
| YQ | TATCAA | 1160.22 | 1179 | 1.016 | **0.016** |
| YQ | TACCAA | 1427.83 | 1397 | 0.978 | **-0.022** |
| YQ | TATCAG | 3239.83 | 2226 | 0.687 | **-0.375** |
| YR | TACCGC | 1307.70 | 2153 | 1.646 | **0.499** |
| YR | TACCGA | 775.30 | 990 | 1.277 | **0.244** |
| YR | TACAGA | 1442.41 | 1834 | 1.271 | **0.240** |
| YR | TACCGG | 1430.23 | 1796 | 1.256 | **0.228** |
| YR | TACAGG | 1416.06 | 1671 | 1.180 | **0.166** |
| YR | TACCGT | 559.87 | 642 | 1.147 | **0.137** |
| YR | TATCGA | 629.99 | 570 | 0.905 | **-0.100** |
| YR | TATCGT | 454.94 | 383 | 0.842 | **-0.172** |
| YR | TATAGA | 1172.07 | 827 | 0.706 | **-0.349** |
| YR | TATCGG | 1162.17 | 629 | 0.541 | **-0.614** |
| YR | TATAGG | 1150.66 | 560 | 0.487 | **-0.720** |
| YR | TATCGC | 1062.60 | 509 | 0.479 | **-0.736** |
| YS | TACAGC | 2204.13 | 3590 | 1.629 | **0.488** |
| YS | TACTCG | 514.46 | 783 | 1.522 | **0.420** |
| YS | TACAGT | 1390.60 | 1887 | 1.357 | **0.305** |
| YS | TATTCA | 1111.75 | 1210 | 1.088 | **0.085** |
| YS | TACTCC | 1945.47 | 2088 | 1.073 | **0.071** |
| YS | TATTCT | 1375.18 | 1466 | 1.066 | **0.064** |
| YS | TACTCA | 1368.18 | 1188 | 0.868 | **-0.141** |
| YS | TATTCC | 1580.84 | 1306 | 0.826 | **-0.191** |
| YS | TACTCT | 1692.37 | 1173 | 0.693 | **-0.367** |
| YS | TATAGT | 1129.96 | 728 | 0.644 | **-0.440** |
| YS | TATTCG | 418.04 | 229 | 0.548 | **-0.602** |
| YS | TATAGC | 1791.02 | 874 | 0.488 | **-0.717** |
| YT | TACACG | 697.26 | 1311 | 1.880 | **0.631** |
| YT | TACACC | 2122.58 | 2696 | 1.270 | **0.239** |
| YT | TACACA | 1718.31 | 2158 | 1.256 | **0.228** |
| YT | TACACT | 1519.54 | 1409 | 0.927 | **-0.076** |
| YT | TATACT | 1234.74 | 1049 | 0.850 | **-0.163** |
| YT | TATACA | 1396.25 | 1049 | 0.751 | **-0.286** |
| YT | TATACC | 1724.75 | 1063 | 0.616 | **-0.484** |
| YT | TATACG | 566.57 | 245 | 0.432 | **-0.838** |
| YV | TATGTT | 986.79 | 1723 | 1.746 | **0.557** |
| YV | TATGTA | 640.76 | 1113 | 1.737 | **0.552** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| YV | TATGTC | 1263.40 | 1862 | 1.474 | **0.388** |
| YV | TATGTG | 2499.39 | 3382 | 1.353 | **0.302** |
| YV | TACGTG | 3075.90 | 2279 | 0.741 | **-0.300** |
| YV | TACGTC | 1554.82 | 991 | 0.637 | **-0.450** |
| YV | TACGTA | 788.55 | 284 | 0.360 | **-1.021** |
| YV | TACGTT | 1214.40 | 390 | 0.321 | **-1.136** |
| YW | TACTGG | 1609.87 | 2212 | 1.374 | **0.318** |
| YW | TATTGG | 1308.13 | 706 | 0.540 | **-0.617** |
| YY | TACTAC | 2256.03 | 2854 | 1.265 | **0.235** |
| YY | TATTAT | 1489.60 | 1459 | 0.979 | **-0.021** |
| YY | TACTAT | 1833.19 | 1760 | 0.960 | **-0.041** |
| YY | TATTAC | 1833.19 | 1339 | 0.730 | **-0.314** |

Table S2

|  |  |
| --- | --- |
| P1-Region | Codon Pair Bias |
| PV-Max | +0.246 |
| PV(M)-wt | -0.034 |
| PV-SD | -0.095 |
| PV-AB | -0.096 |
| PV-MinZ | -0.205 |
| PV-MinXY | -0.391 |
| PV-Min | -0.474 |

**Table S2.** Includes the Codon-pair Bias of various designed as well as the natural nucleotide encodings of the poliovirus P1 protein. The table includes two viruses previously constructed PV-AB and PV-SD (S*4*). The virus PV-SD, had 937 mutations in synonymous codons in the P1 region and was constructed by randomly shuffling the existing codons (S*4*). In PV-SD neither codon bias nor codon pair bias was significantly altered and PV-SD grew with a wt phenotype (S*4*). The second virus PV-AB used only rare codons (S*4*), yet its CPB was not altered drastically either, thus despite derivatives of PV-AB having an attenuated phenotype the attenuation was not due to codon pairing.

These two viruses indicate that the attenuation observed in PV-Min derivative viruses was not a result of random changes in synonymous codons.

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