# **Supporting Information**

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#### **SI Materials and Methods**

Primate Genomic DNA Sources. Selected primate genomic DNA was purchased from the Coriell Cell Repositories, including 11 chimpanzees (*Pan troglodytes*, NG06939, NG03487, NG03489, NG03610, NG03622, NG03623, NG03641, NG03650, NG03656, NG03659, and NG03660), 1 bonobo (*Pan paniscus*, NG05253), 1 gorilla (*Gorilla gorilla*, NG05251), 1 Borneo orangutan (*Pongo pygmaeus*, NG05252), 1 white-cheeked gibbon (*Hylobates leucogenys*, PR01038), 1 patas monkey (*Erythrocebus patas*, NG06116), 1 colobus monkey (*Colobus guereza*, PR00980), 1 rhesus macaque (*Macaca mulatta*, NG08305), 1 pigtailed macaque (*Macaca nemestrina*, NG08452), 1 black-handed spider monkey (*Ateles geoffroyi*, NG05352), and 1 squirrel monkey (*Saimiri sciureus*, NG05311).

Mongoose lemur (*Eulemur mongoz*, DUPC4504) whole blood was purchased from Duke University Primate Center. Genomic DNA was extracted using UltraClean BloodSpin kit (MO BIO Laboratories).

**Plasmid Construction.** The first 20 aa of human rhodopsin (1), or Rho tag (N-MNGTEGPNFYVPFSNATGVVR-C), were inserted between the NheI and EcoRI sites in pCI. All *OR7D4* and *OR7D1* orthologs, synthetic mutants, and reconstructed hypothetical ancestors were then subcloned into this Rho-pCI between the MluI and NotI restriction sites.

OR7D4 synthetic mutants were generated by site-directed mutagenesis through overlap extension PCR from existing clones. Hypothetical ancestors were generated by multiple mutagenesis steps from the closest existing clones. Although the amino acid sequences of ancestral receptors inferred by PAML and those of the actually reconstructed receptors are identical, the exact nucleotide sequences can be different because we did not change nucleotides that do not cause changes in amino acid.

**Cloning and Sequencing of OR7D4 and OR7D1 Orthologs.** *OR7D4* and *OR7D1* orthologs were amplified from various primate genomic DNA. We designed primers based on available sequence data and performed a series of PCR amplifications. ORF-flanking primers were designed based on bushbaby *OR7D4/OR7D1* (forward 5'-ATGGAAGCAGAAAACTATACA-3' and reverse 5'-TCACA-GGCAAGAGGCTGT-3'), chimpanzee *OR7D4* (forward 5'-ATGGAAGCAGAAAACCTTAC-3' and reverse 5'-ATGGAA-GCAGAAAACCTTAC-3'), rhesus macaque *OR7D4* (forward 5'-ATGGAAAGCAGAAAACCATACA-3' and reverse 5'-TCAT-GGACAAGAGGCTG-3'), chimpanzee *OR7D1* (forward 5'-ATGGAAGCAGAAAACCTTAC-3' and reverse 5'-TCACA-TTGGAAAGCAGAAAACCTTAC-3' and reverse 5'-TCACA-TTGGAAAGCAGAAAACCTTAC-3' and reverse 5'-ATGGAAGTAGAAGCAGAAAACCATACA-3' and reverse 5'-ATGGAAGTAGGAC-3'), and rhesus macaque *OR7D1* (forward 5'-ATGAAAGCAGAAAACCATACA-3' and reverse 5'-TCACA-TTTGCTTAAGGGAC-3'), and rhesus macaque *OR7D1* (forward 5'-ATGAAAGCAGAAAACCATACA-3' and reverse 5'-TCACA-TTAGAAAGCAGAAAACCATACA-3' and reverse 5'-TCACA-TTAGAAAGCAGAAAACCATACA-3' and reverse 5'-TCACA-TTAGCTTAAGGGAC-3'), and rhesus macaque *OR7D1* (forward 5'-ATGAAAGCAGAAAACCATACA-3' and reverse 5'-TCACA-TTAGAAAGCAGAAAACCATACA-3' and reverse 5'-TCACA-TTAGCTTAAGGGACC-3').

When the above primers did not amplify from a certain species, we also performed PCR amplifications at reduced annealing temperature using degenerate primers (forward 5'-ATGGAAGCAGAAAACYWTACAGAA-3' and reverse 5'-TCAYRGRCAAGAGKCKGYYCTGCTGAG-3') designed based on the all cloned *OR7D4* sequences and (forward 5'-ATGRAAGCAGAAAACYWTACAGAA-3' and reverse 5'-TCABRGRCAAGAGKCKGYYCTGCTRAG-3') based on all cloned *OR7D4* and *OR7D1* sequences. If all of the above primers did not amplify for a certain species, a pair of internal primers (forward 5'-TTCCTGTCCATGTACCTGGT-3' and reverse 5'-GAGGCTGCCCTGCTGAGGAG-3') designed based on conserved sequences on all cloned *OR7D4* was used. For 4 species,

squirrel monkey, spider monkey, patas monkey, and gibbon, no amplicon corresponding to a potential *OR7D4/OR7D1* gene or pseudogene was obtained using the ORF-flanking primers or degenerate primers or of expected size using the internal primers, supporting the potential absence or significant modification of *OR7D4/OR7D1* gene(s) in these species.

In addition to sequencing the cloned ORs, double-stranded PCR products were also sequenced for verification. The PCR products were either gel-purified using MinElute Gel Extraction Kit (Qiagen), or column-purified using Sephadex (GE Health-Care) or Sephacryl (GE HealthCare) and then sequenced with 3130 or 3730 Genetic Analyzers (Applied Biosystems). For OR7D4, primate genomic DNAs from chimpanzee, bonobo, gorilla, orangutan, colobus monkey, rhesus macaque, and pigtailed macaque were amplified with KOD polymerase with untranslated region (UTR) primers upstream (5'-TGAGCTGCCACTTGCTGT-3') and downstream (5'-AGAGCCGGATATTTAAACC-3') of the OR7D4 ORFs. For OR7D1, genomic DNAs from chimpanzee, bonobo, gorilla, and orangutan were amplified with UTR primers upstream (5'-CCAAGAGTGATATTGAAGAG-3') and downstream (5'-CAAAGTCGTAGGTGCTTTG-3') of the OR7D4 ORFs. The UTR primers were designed based on the chimpanzee sequence. For the rest of the primate orthologs (lemur OR7D4/ OR7D1, rhesus macaque OR7D1, and pigtailed macaque OR7D1), which the UTR primers did not amplify, double-stranded PCR products amplified using the ORF-flanking primers were sequenced to their entirety.

**OR7D4/OR7D1 Gene Gains and Losses in Primates.** When we performed homology searches using the human *OR7D4* nucleotide sequence against the "nr" in the GenBank database, putative *OR7D4/OR7D1* partial sequences were found for gorilla (*Gorilla gorilla*), orangutan (*Pongo pygmaeus*), baboon (*Papio papio*), mangabey (*Cercocebus agilis*), langur (*Trachypithecus auratus*), colobus monkey (*Colobus guereza*), Barbary ape (*Macaca sylvanus*), mongoose lemur (*Eulemur mongoz*), brown lemur (*Eulemur fulvus*), and red-bellied lemur (*Eulemur rubriventer*).

Human *OR7D4* is situated on chromosome 19 in a cluster of 7 intact OR genes and 8 OR pseudogenes. One of these pseudogenes, *OR7D1*p, is adjacent and 95% identical to *OR7D4* at the nucleotide level. The closest intact paralog to *OR7D4* in the human genome, OR7D2, is only 70% identical at the amino acid level. Human OR7D2 does not respond to androstenone or androstadienone (2). In the chimpanzee genome, the orthologs of both *OR7D4* and *OR7D1* have intact ORFs.

OR7D4/OR7D1 orthologs are among the ORs previously sampled from different primate species in several independent studies (3-5). Rouquier et al. (3) performed an OR sequencing analysis from 10 different primate species using OR degenerate primers matching to the conserved amino acid motifs among ORs. Gilad et al. (4) amplified selected ORs from 18 primate species using OR-specific primers and degenerate primers. These studies generated partial sequences of apparent OR7D4/ OR7D1 orthologs, either as putative intact genes or as pseudogenes, from various primate species, including several prosimians, Old World Monkeys, and apes. We performed further data-mining in the genome sequences of orangutan (Pongo pygmaeus, a Great Ape species), rhesus macaque (Macaca mulatta, an Old World Monkey species), marmoset (Callithrix *jacchus*, a New World Monkey species), and bushbaby (Otolemur garnetti, a prosimian species). In the case of the rhesus macaque, we found that the OR annotated as OR7D4 in the database was actually an apparent pseudogene representing an *OR7D1* ortholog and there was a partial unannotated sequence corresponding to *OR7D4* in the genome assembly. We did not find apparent *OR7D4/OR7D1* orthologs in the 6 times coverage genome sequence of marmoset. In the case of bushbaby, we found only one *OR7D4/OR7D1* ortholog. We noted that none of these primate orthologs was from New World Monkey species although a significant number of New World Monkeys were included in the studies mentioned earlier.

Sequencing of the our PCR amplification products verified the presence of OR7D4/OR7D1 orthologs in 8 out of the 12 primate species used, namely, chimpanzee, bonobo, gorilla, orangutan, rhesus macaque, pigtailed macaque, colobus monkey, and mongoose lemur (Fig. S2). Among them, 6 species, chimpanzee, bonobo, gorilla, orangutan, rhesus macaque, and pigtailed macaque, appeared to have both OR7D4 and OR7D1 orthologs, whereas we could clone only one OR7D4/OR7D1 ortholog from mongoose lemur. This, together with the fact that we found only one OR7D4/OR7D1 ortholog in the genome sequence of another prosimian species, bushbaby, is consistent with the idea that OR7D4/OR7D1 duplication probably occurred after the split between the lemurs and the rest of the primate order. Sequencing confirmed that OR7D1 is a pseudogene in human and both macaque species. We did not find a colobus monkey OR7D1 ortholog.

Four species, gibbon, patas monkey, squirrel monkey, and spider monkey did not appear to have the orthologs to *OR7D4/OR7D1*. We noted that gibbon, squirrel monkey, and a squirrel monkey congener (*Saimiri boliviensis*) also did not give apparent *OR7D4* orthologs in a previous study (3). We could not exclude the possibility that *OR7D4/OR7D1* orthologs actually exist in some of these species. Whole genome sequencing data from these species would provide more accurate answers.

We also noted a divergence of OR7D4/OR7D1 sequences within species. While the mongoose lemur OR7D4/OR7D1, gorilla OR7D4, and bonobo OR7D4 did not show polymorphisms, all other PCR products had some level of heterozygosity in the 2 chromosomes of the one individual sequenced. For example, rhesus macaque OR7D4 was represented by an intact allele and a pseudogenized allele caused by a 2-bp deletion (Fig. S2.4). Additionally, we found that chimpanzee had an allele with a 4-bp insertion, resulting in a frameshifted nonfunctional allele among the chimpanzees we sequenced. Gorilla OR7D1 had one pseudogenized allele.

Nucleotide and peptide sequences of *OR7D4* from 8 species (colobus monkey, pigtailed macaque, rhesus macaque, orangutan, gorilla, bonobo, chimpanzee, and human), *OR7D1* from 4 species (orangutan, gorilla, bonobo, and chimpanzee), and *OR7D4/OR7D1* from mongoose lemur were aligned using ClustalW as implemented in MEGA4 (6). *OR7D1* sequences from 3 species (pigtailed macaque, rhesus macaque, and human) were excluded due to pseudogenizations. Phylogenetic trees for primate *OR7D4/OR7D1* was constructed using a neighbor-joining method in MEGA4 with support for branches assessed by bootstrap analyses of 1,000 replicates. This resulted in a phylogeny roughly congruent to the widely accepted primate phylogeny (7), indicating that all sequences isolated by our PCR strategy were truly orthologous.

**Maximum Likelihood Analysis of OR7D4/OR7D1.** Maximum likelihood analysis was performed with OR7D4/OR7D1 sequences with CODEML in the PAML4a or 3.15 software package (8). When the individual of a certain species was heterozygous for OR7D4/OR7D1, the intact, functional, and/or the most common allele was used in PAML analysis.

To detect positive selection, branch-specific models and sitespecific models were used. Global  $\omega$  values were calculated using all 13 *OR7D4/OR7D1* sequences (OR7D4+OR7D1 dataset) by

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a free-ratio model, which allowed  $\omega$  to vary along different branches. Various likelihood ratio tests using 1-ratio (M0), 2-ratio, and 3-ratio models were used to determine whether  $\omega$ values were significantly different in the human, Great Ape, and catarrhine lineages from the background lineages and whether these  $\omega$  values were >1. Twice the difference of the likelihood values of the tree obtained under each model approximately followed a  $\chi^2$  distribution and allowed the calculation of the associated P value to accept or reject the null model.

We first obtained a global dN/dS ratio, or  $\omega$  value, using model M0, which allowed one  $\omega$  value across all sites and all lineages in the gene, and found no sign of positive selection on *OR7D4* as a whole, as the  $\omega$  value was less than 1 ( $\omega = 0.4$ ). This was expected since the majority of the amino acid residues in any given protein were subject to functional and structural constraints and were thus likely to be under purifying selection in the course of evolution. Next, we calculated the global dN/dS ratio for each branch on the tree using the free-ratio model, which allowed  $\omega$  to vary along each branch. We found that  $\omega$  was more than 1 in 3 *OR7D4* lineages and one *OR7D1* lineage. Subsequent analysis using 1-ratio, 2-ratio, and 3-ratio branch models allowed for a battery of likelihood ratio tests, confirming that the  $\omega$  value of the Great Ape *OR7D4* branch was indeed greater than that of the rest of the tree, indicating accelerated evolution.

Whole-gene dN/dS ratio is not designed to identify specific domains/residues of positive selection, especially when the rest of the gene is subject to purifying selection (9). To determine whether any codon position was associated with dN/dS, or  $\omega$ , significantly >1, multiple alignments of all 13 OR7D4/OR7D1 sequences (OR7D4+OR7D1 dataset), as well as a smaller dataset containing only the OR7D4 sequences from 8 species and the OR7D4/OR7D1 from lemur (OR7D4 only dataset), were fitted to several site-specific models: M0 allowed one ratio across all sites; M1 allowed 2  $\omega$  values, one of neutral selection, with  $\omega >$ 1 disallowed; M2 added one more site class to M1, with  $\omega > 1$ allowed; M3 allowed for K classes of sites with discrete  $\omega$  values, with  $\omega > 1$  allowed; M7 fitted the data to a beta distribution, with  $\omega > 1$  disallowed; and M8 added one more site class to M7, with  $\omega >$  1 allowed. The neutral models M0, M1, and M7 were compared to the positive selection models M3, M2, and M8, respectively. The M3 vs. M0 test was a test of heterogeneity of  $\omega$  among sites rather than for positive selection. M2, M3, and M8 identified amino acid residues under positive selection with posterior probabilities calculated by both naïve empirical Bayes (NEB) and BEB approach. Any site with a posterior probability of positive selection >0.95 calculated with BEB was considered as positively selected (10,11).

Using these 3 site-specific models for positive selection, along with their nested null models, we carried out additional likelihood ratio tests asking if there was a subset of amino acid residues of OR7D4/OR7D1 under positive selection when the gene was computationally partitioned into 2 or more site classes allowing at least one class for positive selection. All likelihood ratio tests supported positive selection on OR7D4 in the site models. We then used the empirical Bayes calculations under all positive selection site models to identify specific residues that have been subject to positive selection in primates. We found that some residues in OR7D4 appeared to be under positive selection with a high posterior probability. Positively selected sites predicted using different site-specific models (M2 or M8) or datasets (OR7D4 only or OR7D4 and OR7D1 combined) were consistent.

We also performed branch-site model A (12) to test for positive selection on specific sites within OR7D4/OR7D1 along specific branches. However, likelihood ratio test results were not statistically significant (P = 0.08 or higher), probably reflecting the low power for identifying specific sites on specific lineages that evolve under positive selection. Hypothetical ancestors were reconstructed using the marginal reconstruction algorithm with CODEML in PAML4a. Sequences of *OR7D4* from 8 species (colobus monkey, pigtailed macaque, rhesus macaque, orangutan, gorilla, bonobo, chimpanzee, and human), *OR7D1* from 7 species (pigtailed macaque, rhesus macaque, orangutan, gorilla, bonobo, chimpanzee, and human), and *OR7D4/OR7D1* from mongoose lemur were used. When the individual of a certain species was heterozygous for *OR7D4/OR7D1*, the intact, functional, and/or the most common allele was used. Only nonsynonymous changes were accounted for in the subsequent site-directed mutagenesis for creating ancestors and their corresponding synthetic mutants.

Luciferase Assay and Data Analysis. Rho-tagged ORs were transfected into the Hana3A cell line (13) along with a short form of human RTP1, hRTP1S, which enhances functional expression of the ORs (14). Cells were grown in a 37 °C incubator with 5% CO<sub>2</sub>. Dual-Glo Luciferase Assay System (Promega) was used to measure the firefly and Renilla luciferase activities as previously described (13). CRE-luciferase (Stratagene) was used to measure receptor activation. Renilla luciferase driven by a constitutively active SV40 promoter (pRL-SV40; Promega) was used as an internal control for cell viability and transfection efficiency. Hana3A cells were plated on polyD-lysine-coated 96-well plates (BioCoat; Becton Dickinson). Plasmid DNA of the receptor variants and hRTP1S was transfected using Lipofectamine2000. For each 96-well plate, 1 µg of CRE-Luc, 1 µg of pRL-SV40, 5  $\mu$ g of OR, and 1  $\mu$ g hRTP1S were transfected. About 24 h posttransfection, the medium was replaced with CD293 chemically defined medium (Gibco) and then the cells were incubated for 30 min at 37 °C and 5% CO<sub>2</sub>. The medium was then replaced with odorant solution diluted in CD293 and the cells were incubated for 4 h at 37 °C and 5% CO2. We followed the manufacturer's protocols for measuring luciferase and Renilla luciferase activities. Luminescence was measured using Wallac Victor 1420 plate reader (Perkin-Elmer).

Data were analyzed with Microsoft Excel and GraphPad Prism 4. Normalized luciferase activity was calculated by the

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formula [luc(N)-luc(lowest)]/[luc(highest)-luc(lowest)], where luc(N) = luminescence of firefly luciferase divided by luminescence of Renilla luciferase of a certain well; luc(lowest) = lowest luminescence of firefly luciferase divided by luminescence of Renilla luciferase of a plate or a set of plates; and luc(highest) = highest luminescence of firefly luciferase divided by luminescence of Renilla luciferase of a plate or a set of plates.

An F test was used to compare the best-fit values of EC<sub>50</sub> of the dosage response curves between the hypothetical ancestors and each synthetic mutant to assess whether the dose-response curves for androstenone and/or androstadienone of a mutant was significantly different from those of the respective ancestors. We note that the  $EC_{50}$  value of a given receptor can vary between experiments, but the relative sensitivity of the receptor variants remains the same. Data from the same experiment were always used when we performed the statistical tests. The F test, as implemented in GraphPad Prism 4, compares the best-fit value of the selected parameter (LogEC50 in this case) between data sets. It fits the data 2 ways and compares the results with an F test. It will first fit each data set independently; it will then do a global fit, finding one shared (among data sets) best-fit value for each parameter selected. The F test gives an F value, degrees of freedom expressed as DFn and DFd, and a P value. DFn is the numerator degrees of freedom, which is the number of parameters (k). DFd is the denominator degrees of freedom, which is the number of variables (n) minus one plus k. The P value represents supporting or rejecting the null hypothesis, that is, LogEC50 is the same for all data sets. For the Great Ape ancestor and the species in the Old World Monkey lineages, we listed the amino acid changes from the catarrhine ancestor and compared the functional changes with the catarrhine ancestor. For the species in the Great Ape lineage, we listed the amino acid change from the Great Ape or hominine ancestor and compared the functional changes with the respective ancestor. Each residue was sorted into 1 of the 3 different functional classes: decrease in function, no significant change in function, or increase in function by significance of the F test. A Bonferroni correction for multiple comparisons was applied to the F test.

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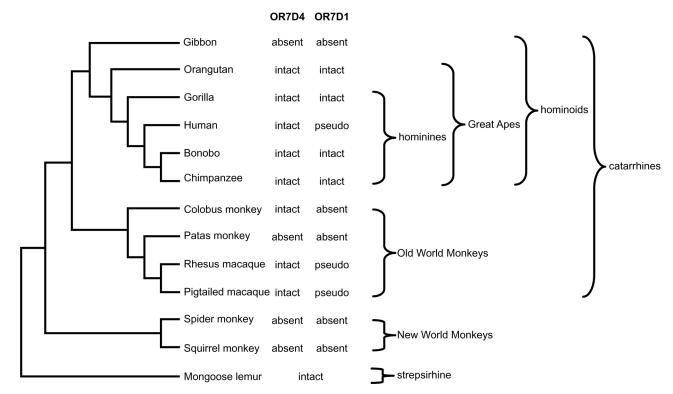


Fig. S1. All primate species whose genomic DNA were used for OR7D4/OR7D1 cloning. Different primate lineage names used throughout the text are indicated by brackets. The status of OR7D4 and OR7D1 orthologs for each species is indicated either as intact, pseudo (pseudogene), or absent (not found in the genome).

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GORILLA_OR7D1-1 GORILLA_OR7D1-2	с с с	.T. .T. .T. .T.	 	G G G	 	· · · · · · ·	.c.	 	· · · · · · · · · · ·	· · · · · · · · · · ·	c c c	G G G T	G G G G	C.G C.G C.G C.G	  	· · · · · · · · · · ·	 	  	 	c c c	· · · · · · · · · · ·	· · · · · · · · · · · ·	A A 	· · ·	· · ·	
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	C c c c	.T. .T. .T. .T. .T. .T.	· · · · · · · · · · · ·	G G G G G	···· ···· ····	· · · · · · · · · · · ·	.c. .c. .c. .c. .c.	· · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	c c c c c	G G T G	G G G G G G	C.G C.G C.G C.G C.G C.G	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · ·	c c c c	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	A A  G	 	· · ·	
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1	C c c c	.T. .T. .T. .T. .T.	· · · · · · · · · · · ·	G G G G G	···· ···· ····	· · · · · · · · · · · ·	.c. .c. .c. .c.	· · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	c c c c c	G G T G	G G G G G G	C.G C.G C.G C.G C.G C.G	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · ·	c c c c	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	A A  G	 	· · ·	
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	C C C C C C L111	.T. .T. .T. .T. .T. .T. .T.	···· ··· ··· 111	G G G G G G 111	···· ···· ···· 111	· · · · · · · · · · · · · · ·	.C. .C. .C. .C. .C. .C.	   1111	···· ··· ··· ··· 111	···· ··· ··· ··· 111	c c c c c c c	G G T G G .TG 111	G G G G G G 111	C.G C.G C.G C.G C.G C.G C.G 111	···· ··· ··· 122	···· ···· ··· 222	   A	···· ···· ··· 2222	···· ···· ··· 222	c c c c c 222	···· ···· ··· 2222	···· ···· ··· 2222	A A   2222	   222	   2222	···· ··· ··· 222
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	C C C C C C C 1111 555	.T. .T. .T. .T. .T. .T.	    111 666	G G G G G 111 666	   1111 677	   1111 777	.C. .c. .c. .c. .c. 111 777	   1111 778	   1111 888	   1111 888	C C C C C C 111 888	G G T G G .TG 111 999	G G G G G J.11 999	C.G C.G C.G C.G C.G C.G 111 999	   122 900	···· ··· ··· 2222 000	   222 000	···· ···· ···· 2222 001	   2222 111	C C C C C C 222 111	   2222 111	   2222 222	A A   222 222	   2222 222	   2222 233	   222 333
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1	C C C C C C 111 555 789 TCT	.T. .T. .T. .T. .T. .T. .T. .111 666 012 CAC	   1111 666 345 CTC	G G G G 111 666 678 CAC	   111 677 901 ACC	   1111 777 234 ccc	.C. .C. .C. .C. .C. 111 777 567 ATG	  1111 778 890 TAC	   1111 8888 123 TTC	   1111 888 456 TTC	C C C C C 1111 8888 789 CTC	G G T G .TG 111 999 012 TCC	G G G G G J111 999 345 AAT	C.G C.G C.G C.G C.G C.G 111 999 678 TTG	   122 900 901 TCC	  222 000 234 TTT	   222 000 567 GTT	   2222 001 890 GAC	  2222 111 123 ATC	C C C C 222 111 456 TGT	   2222 111 789 TTC	   2222 222 012 ACC	A A G  2222 345 TCC	222 222 678 ACC	222 233 901 ACC	222 333 234 ATC
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1	C C C C C C 1111 5555 789 TCT C	.T. .T. .T. .T. .T. .T. .T. .T. 111 666 012 CAC	   1111 666 345 CTC T	G G G G 111 666 678 CAC	   111 677 901 ACC	  111 777 234 CCC	.C. .C. .C. .C. .C. 1111 777 567 ATG 	  1111 778 890 TAC	  1111 888 123 TTC 	   111 888 456 TTC 	C C C C C 1111 888 789 CTC 	G G T G .TG 111 999 012 TCC T	G G G G G 111 999 345 AAT C	C.G C.G C.G C.G C.G C.G 111 999 678 TTG C	   122 900 901 TCC 	222 000 234 TTT	   2222 0000 567 GTT 	   2222 001 890 GAC	  2222 111 123 ATC 	C C C C 2222 1111 456 TGT 	2222 1111 789 TTC	  2222 2222 012 ACC .T.	A A G  2222 245 TCC 	222 222 678 ACC	222 233 901 ACC A	222 333 234 ATC G.
GORILLA OR7D1-1 GORILLA OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBÜS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2	C C C C C C 1111 5555 7899 TCT C C	.T. .T. .T. .T. .T. .T. .T. 111 666 012 CAC 	  111 6666 345 CTC T	G G G G 111 666 678 CAC 	  1111 6777 9011 ACC 	  1111 777 234 CCC 	.C. .C. .C. .C. .C. 111 777 567 ATG 	111 778 890 TAC	  1111 888 123 TTC 	  111 888 456 TTC 	C C C C 1111 8888 7899 CTC 	G G T G .TG 111 999 012 TCC T	G G G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G 78 TTG C C	  122 900 901 TCC 	222 000 234 TTT	   222 000 567 GTT  C	222 001 890 GAC	222 111 123 ATC	C C C C 2222 1111 456 TGT 	2222 1111 789 TTC	  222 222 012 ACC .T. .T. .T.	A A G  2222 345 TCC  T	222 222 678 ACC	222 233 901 ACC A A	222 333 234 ATC G G G
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1	C C C C C C C 1111 5555 7899 TCT C C	.T. .T. .T. .T. .T. .T. .T. .T. .T. 	  111 6666 345 CTC T	G G G G 111 666 678 CAC 	  111 677 901 ACC 	  1111 7777 234 CCCC 	.C. .C. .C. .C. 1111 777 567 ATG  	111 778 890 TAC	  111 888 123 TTC 	   111 888 456 TTC  	C C C C 1111 8888 7899 CTC 	G G T G .TG 111 999 012 TCC T 	G G G G G G 111 999 345 AAT C C C	C.G C.G C.G C.G C.G C.G C.G C.G C.G TII 999 678 TTG C C C	122 900 901 TCC	222 000 234 TTT	   2222 0000 567 GTT C C	222 001 890 GAC	222 111 123 ATC	C C C C 222 111 456 TGT  	222 111 789 TTC	  222 222 012 ACC .T. .T. .T. .T.	A A   222 222 345 TCC   	222 222 678 ACC	222 233 901 ACC A A A	222 333 234 ATC G G G
GORILLA OR7D1-1 GORILLA OR7D1-2 BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR OR7D4/OR7D1 COLOBUS OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. 	  1111 6666 3455 CTCC T  	G G G G 1111 6666 678 CAC 	111 677 901 ACC	1111 777 234 CCC  G	.C. .C. .C. .C. .C. 1111 777 567 ATG  	111 778 890 TAC 	111 888 123 TTC 	  1111 888 456 TTC  	C C C C C C C 	G G T G .TG 111 999 012 TCC T  	G G G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G TTG C C C C	122 900 901 TCC	222 000 234 TTT 	222 000 567 GTT C C C C	2222 001 890 GAC	2222 1111 1233 ATC 	C C C C 222 111 456 TGT  	2222 1111 789 TTC 	  222 222 012 ACC .T. .T. .T. .T. .T.	A A   222 222 345 TCC  T  	222 222 678 ACC	222 233 901 ACC A A A A	 222 333 234 ATC G G G G G G
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-2 PIGTAIL_OR7D4-2 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T.  	111 666 345 CTC T	G G G G G 111 666 678 CAC 	111 677 901 ACC	111 777 234 CCC  G	.C. .C. .C. .C. .C. 1111 777 567 ATG  	111 778 890 TAC	 1111 888 123 TTC  	  1111 888 456 TTC  	C C C C C 1111 888 789 CTC  	G G T G T G T 9999 012 TCC T  	G G G G G G G 1111 999 345 .C C C C C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC	222 000 234 TTT 	   222 0000 567 GTT  C C C C C	2222 001 890 GAC	222 111 123 ATC	C C C C 2222 1111 456 TGT  	222 111 789 TTC 	 222 222 012 ACC .T. .T. .T. .T. .T. .T.	A A   222 222 345 TCC  T  	2222 2222 678 ACC	2222 233 901 ACC A A A A A	222 333 234 ATC G G G G G G G
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-2 GORNGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 BONOBO_OR7D4 BONOBO_OR7D4	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T.  	1111 6666 345 CTCC T	G G G G G G G 1111 6666 678 CAC  	1111 677 901 ACC 	1111 777 234 CCC  G G	.C. .C. .C. .C. .C. 1111 777 567 ATG  	1111 778 890 TAC	111 888 123 TTC 	1111 888 456 TTC 	C C C C C C C 	G G T G T G T 9999 012 TCC T  	G G G G G G G 1111 9999 3455  C  C  C  C  C  C  C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	  1222 9000 901 TCC  	222 000 234 TTT 	   2222 0000 5677  CC C C C C C	2222 0011 890 GAC	2222 1111 123 ATC	C C C C C 2222 1111 4566 TGT  	2222 111 789 TTC 	  2222 2222 012 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A   222 222 345 TCC   T  	2222 2222 678 ACC	222 233 901 ACC A A A A A	222 333 234 ATC G G G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-2 PIGTAIL_ORTD4-1 RHESUS_ORTD4-1 RHESUS_ORTD4-2 ORANGUTAN_ORTD4-1 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T.  	1111 6666 345 CTC T	G G G G G 1111 6666 678 CAC  	1111 677 901 ACC 	1111 7777 234 CCCC  G G	.C. .C. .C. .C. .C. .C. 1111 7777 5677 ATG  	111 778 890 TAC 	1111 888 123 TTC 	1111 888 456 TTC 	C C C C C C 1111 8888 789 CTC   	G G T G G T 9999 012 TCC T  	G G G G G G 1111 9999 345  C  C  C  C  C  C  C 	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	  1222 9000 901 TCC  	222 000 234 TTT 	   2222 000 567 GTT C C C C C C C	2222 001 890 GAC	 2222 1111 123 ATC 	C C C C C 2222 1111 4566 TGT  	2222 111 789 TTC 	 2222 2222 012 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A   2222 2222 345 TCC    	222 222 678 ACC	2222 233 901 ACC A A A A A A A	222 333 234 ATC G G G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-1 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPANZEE_ORTD4 CHIMPANZEE_ORTD4	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T. 	1111 6666 345 CTCC T	G G G G G 1111 6666 678 CAC  	1111 677 901 ACC 	1111 7777 234 CCC  G G G	.C. .C. .C. .C. .C. .C. .C. .C. .TT ATG  	 1111 778 890 TAC 	1111 888 123 TTC 	1111 888 456 TTC 	C C C C C C 1111 8888 789 CTC   	G G G T T T 9999 012 TCC T   	G G G G G G G 1111 9999 3455 AAT  C C C C C C C C C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC 	222 000 234 TTT 	   2222 0000 5677 GTT  CC C C C C C	222 001 890 GAC	2222 1111 123 ATC  	C C C C 2222 1111 456 TGT  	2222 1111 789 TTC 	 222 222 222 012 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A   2222 2222 345 TCC    	2222 2222 678 ACC	 2222 233 901 ACC A A A A A A A A	222 333 234 ATC G G G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 RHESUS_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 BONOBO_ORTD4 BONOBO_ORTD4 CHIMPARZEE_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 PIGTAIL_ORTD4 HUMAN_ORTD4	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.   	1111 666 345 CTC T 	G G G G G G G 	1111 677 901 ACC	1111 7777 2344 CCCC  G G G	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	1111 778 890 TAC	111 888 123 TTC 	1111 888 456 TTC 	C C C C C C C 	G G G T G T G 1111 9999 012 TCC T   	G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC	2222 000 234 TTT 		2222 001 890 GAC	2222 1111 1233 ATC 	C C C C 2222 1111 456 TGT  	2222 111 789 TTC     	 2222 2222 0122 .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A 222 222 345 TCC    	222 222 678 ACC	 2222 233 901 ACC A A A A A A A A A	222 333 234 ATC G G G G G G G G G G.
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4 CHIMPANZEE_OR7D4 CHIMPANZEE_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.          	1111 6666 345 CTC T 	G G G G G G G 	1111 6777 901 ACC 	1111 7777 2344 CCCC  G G G	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	 1111 778 890 TAC  	1111 888 123 TTC 	1111 888 456 TTC 	C C C C C C C 	G G G T G T G T G T G T T   	G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	1222 900 901 TCC	2222 0000 234 TTT 		2222 0011 890 GAC	2222 1111 1233 ATC 	C C C C 2222 1111 4566 TGT  	2222 1111 7899 TTC       	2222 2222 012 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A 222 222 345 TCC    	2222 2222 678 ACC	 2222 233 901 ACC A A A A A A A	222 333 234 ATC G G G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 RHESUS_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPARZEE_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD1 RHESUS_ORTD1 ORANGUTAN_ORTD1-1 ORANGUTAN_ORTD1-1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.   	1111 666 345 CTC T	G G G G G 1111 6666 678 CAC 	1111 6777 901 ACC	1111 7777 234 CCC G G G	.C. .C. .C. .C. .C. 1111 7777 7567 ATG  	 1111 778 890 TAC  	1111 888 123 TTC 	1111 888 456 TTC 	C C C C C C C 1111 8888 789 CTC  	G G G G G G G 	G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC	222 000 234 TTT 		2222 001 890 GAC	2222 2111 1233 ATC       	C C C C 2222 1111 4566 TGT    	2222 1111 789 TTC       	2222 2222 012 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A 2222 345 TCC   	2222 2222 678 ACC	2222 233 901 ACC A A A A A A A A A	222 333 234 ATC G G G G G G G G G G.
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 ULEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 GORILLA_OR7D4 HUMAN_OR7D1 PIGTAIL_OR7D4 PIGTAIL_OR7D4 BONOBO_OR7D4 CHIMPANZEE_OR7D4 HUMAN_OR7D1 PIGTAIL_OR7D1 RHESUS_OR7D1-1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-2 GORILLA_OR7D1-2	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.          	1111 6666 345 CTC CTC T	G G G G G G G 1111 6666 678 CAC   	1111 677 901 ACC	1111 7777 234 CCCC  G G G	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	 1111 778 890 TAC  	1111 888 123 TTC 	1111 888 456 TTC 	C C C C C C C 1111 888 789 CTC   	G G T T T T T T	G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	1222 900 901 TCC 	2222 0000 234 TTTT 		222 001 890 GAC	2222 1111 1233 ATC         	C C C C 2222 1111 456 TGT  	2222 1111 789 TTC       	 222 222 222 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A   2222 2222 345 TCC    	2222 2222 678 ACC	 2222 2333 901 ACC A A A A A A A A A	 222 233 234 ATC G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 RHESUS_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPARZEE_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD1 RHESUS_ORTD1 ORANGUTAN_ORTD1-1 ORANGUTAN_ORTD1-1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T. .T.	1111 6666 345 CTC CTC T	G G G G G G 1111 6666 678 CAC    	1111 677 901 ACC 	1111 7777 234 CCCC  G G G G	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	 1111 778 890 TAC   	1111 888 123 TTC  	1111 888 456 TTC 	C C C C C C C 	G G T T T 9999 0122 TCCC T T T  	G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC 	222 000 234 TTT 	A 2222 0000 5677 C C C C C C C	222 001 890 GAC	 2222 1111 1233 ATC       	C C C C 2222 1111 456 TGT   	2222 1111 789 TTC       	 2222 2222 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A A C 2222 2222 3455 TCCC  TCC.  TCC.  C C	2222 2222 678 ACC	 2222 233 901 ACC A A A A A A A A A	 2222 3333 234 ATC G G G G G G G G.
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1-2 HUMAN_OR7D1 COLOBUS_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 GORILLA_OR7D4 BONOBO_OR7D4 HUMAN_OR7D3 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 BONOBO_OR7D1 RESUS_OR7D1 RESUS_OR7D1-1 GORILLA_OR7D1-2 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 666 345 CTC T	G G G G G 1111 6666 678 CAC 	1111 677 901 ACC 	1111 7777 234 CCCC G G G G	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	1111 778 890 TAC 	1111 888 123 TTC 	1111 888 456 TTC 	C C C C C C 1111 8888 7899 CTC    	G G T G G G G G	G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC	222 000 234 TTT 		2222 001 890 GAC	 2222 1111 123 ATC       	C C C C 2222 1111 4566 TGT   	222 111 789 TTC         	 2222 2012 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A A C C 2222 2345 TCCC  TCCC  C C C C	2222 2222 678 ACC	2222 2333 901 ACC A A A A A A A A A	 222 333 234 4TC G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 BONOBO_ORTD1-1 GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-2	CC. CC.C.C. CC.	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 666 345 CTC T 	G G G G G 1111 6666 678 CAC 	1111 6777 901 ACC 	1111 7777 234 CCC   G G G 	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	 1111 778 890 TAC  	111 888 123 TTC	1111 8888 456 TTC 	C C C C C C C 	G G T G T G G T 1111 9999 012 TCC T  	G G G G G G G C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC	222 2000 234 TTT 		2222 001 GAC	 2222 1111 123 ATC       	C C C C C 2222 1111 4566 TGT   	222 111 789 TTC      	 2222 2022 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A 2222 2345 TCC  T  	2222 2222 678 ACC 	 2222 233 901 A A A A A A A 	 2222 2333 234 ATC G G G G G G G G.
GORILLA ORTDI-1 GORILLA ORTDI-1 GORILLA ORTDI-2 BONOBO_ORTDI-1 EONOBO_ORTDI-2 CHIMPANZEE_ORTDI-2 CHIMPANZEE_ORTDI-2 HUMAN_ORTDI LEMUR_ORTD4/ORTDI COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 PIGTAIL_ORTD4 BONOBO_ORTD1 PIGTAIL ORTD1 PIGTAIL ORTD1 PIGTAIL ORTD1 PIGTAIL ORTD1-1 GORILLA_ORTD1-1 GORILLA_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 6666 345 CTC T 	G G G G G G G 	1111 677 901 ACC       	1111 7777 234 CCCC  G G G G	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	1111 778 890 TAC	111 888 123 TTC 	1111 888 456 TTC 	C C C C C C C 	G G T T T G T 9999 012 TCC T   	G G G G G G G 9999 9999 9345 AAT  C C C C C C C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC	2222 000 234 TTT 		2222 0011 8900 GAC	2222 1111 123 ATC         	C C C C 2222 1111 4566    	2222 111 789 TTC       	2222 2222 012C ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A A C C A A A	222 222 222 678 ACC	2222 233 901 ACC A A A A A A A A A	 222 333 234 G G G G G G G G.
GORILLA ORTDI-1 GORILLA ORTDI-1 GORILLA ORTDI-2 BONOBO_ORTDI-1 EONOBO_ORTDI-2 CHIMPANZEE_ORTDI-2 CHIMPANZEE_ORTDI-2 HUMAN_ORTDI LEMUR_ORTD4/ORTDI COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 PIGTAIL_ORTD4 BONOBO_ORTD1 PIGTAIL ORTD1 PIGTAIL ORTD1 PIGTAIL ORTD1 PIGTAIL ORTD1-1 GORILLA_ORTD1-1 GORILLA_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T. .T.	1111 6666 345 CTC T 	G G G G G G 1111 6666 678 CAC         	1111 6777 901 901 901 901 901 901 901 901 901 901	1111 7777 234 CCCC  G G     	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	1111 778 890 TAC	 111 8888 TTC      	1111 888 456 TTC 	C C C C C C 1111 8888 789 789 789 789 789 789 789 789 78	G G G T G TG 1111 9999 0122 TCCC T       	G G G G G G G C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	 122 900 901 TCC       	2222 0000 2344 TTTT      		2222 0011 8900 GAC       	 2222 1111 1233 ATC       	C C C C 2222 1111 456 TGT        2222 222	2222 111 789 TTC       	 2222 2222 012 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A A G 2222 2345 TCC C TCC C A A A A G A A.	2222 2222 222 222 222 222 222 222 222	 2222 233 901 ACC A A A A A A A A A	 222 233 234 ATC G G G G G G G G G G.
GORILLA ORTDI-1 GORILLA ORTDI-1 GORILLA ORTDI-1 BONOBO_ORTDI-1 CHIMPANZEE_ORTDI-2 CHIMPANZEE_ORTDI-2 HUMAN_ORTDI LEMUR_ORTD4/ORTDI COLOBUS ORTD4 PICTAIL_ORTD4-1 PICTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPANZEE_ORTD4 RHESUS_ORTD4 BONOBO_ORTD1 RHESUS_ORTD1 RHESUS_ORTD1 RHESUS_ORTD1 CRANGUTAN_ORTD1-1 GORILLA_ORTD1-1 GORILLA_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTDI	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 6663 345 CTC T        	G G G G G 1111 6666 678 CAC         	1111 677 901 ACC         	1111 7777 234 CCC  G G     	.C. .C. .C. .C. .C. .C. .C. .C. .C. .C.	 1111 778 890 TAC       	1111 888 123 TTC         	1111 888 456 TTC         	C C C C C C C 	G G T TG 1111 9999 0122 TCC T T      	G G G G G G G C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	 1222 9000 901 TCC       	2222 0000 234 TTT       		2222 001 890       	 2222 1111 1233 ATC       	C C C C C 1111 456 TGT         	 2222 1111 789 TTC       	 2222 2222 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A A C 2222 2345 TCCC  TCCC  C C C C	2222 2222 678 ACC       	 2222 233 901 ACC A A A A A A A	 222 333 234 4TC 6 6 6 6 6 6 6 6 6 6.
GORILLA ORTD1-1 GORILLA ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-2 HUMAN_ORTD4 PIGTAIL_ORTD4-2 GORILLA_ORTD1 CHIMPANZEE_ORTD1-1 GORILLA_ORTD1-1 GORILLA_ORTD1-2 GORILLA_ORTD1-2 HUMAN_ORTD1-2 HUMAN_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1	CC. CC.C.C. CC.	.T. .T. .T. .T. .T. .T. .T. .T.	1111 6666 345 CTC T        	G G G G G G G 	1111 677 901 ACC       	1111 7777 234 CCCC G. G. G. G. G. C. C. C. C. C. C. C. C. C. C. C. C. C.	.C. .C. .C. .C. .C. .C. .T111 7777 5667 ATG        2222 5555 3453	1111 778 890 TAC         	1111 888 123 TTC       	1111 888 456 TTC         	CCCCCCC	G G T T T 9999 0122 TCC T T      	G G G G G G C C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.C C.C	122 900 901 TCC         	2222 0000 234 TTT       		2222 001 890 GAC         	 2222 1111 1233 ATC         	C C C C C C C 	2222 1111 789 TTC       	 2222 2222 0122 .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A A C C 2222 2345 TCCC C C C C C C C	2222 2222 678 ACC         	 2222 233 901 ACC A .A .A .A .A .A .A .A .A .A .A .A .A	 2222 333 234 ATC G G G G G G G G G G.
GORILLA ORTDI-1 GORILLA ORTDI-1 GORILLA ORTDI-1 BONOBO_ORTDI-1 CHIMPANZEE_ORTDI-2 CHIMPANZEE_ORTDI-2 HUMAN_ORTDI LEMUR_ORTD4/ORTDI COLOBUS ORTD4 PICTAIL_ORTD4-1 PICTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPANZEE_ORTD4 RHESUS_ORTD4 BONOBO_ORTD1 RHESUS_ORTD1 RHESUS_ORTD1 RHESUS_ORTD1 CRANGUTAN_ORTD1-1 GORILLA_ORTD1-1 GORILLA_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTDI	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 666 345 CTC T        	G G G G G G G 	1111 677 901 ACC 	1111 777 234 CCC G. G. G. G. C C C C C C C C C C C C	.C. .C. .C. .C. .C. 1111 7777 5677 ATG      2202 5555 3455 ATTT C	1111 778 890 TAC         	1111 888 123 TTC       	1111 888 456         	C C C C C C 1111 8889 789 789 789 789 789 789 789 789 78	G G T T T 999 012 TCC T        	G G G G G G G C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC         	2222 0000 2344 TTT       		2222 0011 890 GAC       	 2222 1111 123 ATC       	C C C C C C 2222 1111 456 TGT         	2222 1111 789 TTC       	 2222 2222 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A A C 2222 2222 345 TCC TCC C C C C C C	2222 678 ACC       	2222 233 901 ACC A A A A A A A	 222 333 234 G G G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-2 GORILLA ORTD1-2 CHIMPANZEE ORTD1-1 CHIMPANZEE ORTD1-2 CHIMPANZEE ORTD1-2 CHIMPANZEE ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4-1 ORANGUTAN_ORTD1-1 GORILLA_ORTD1 CHIMPANZEE ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-3 CHIMPANZEE_ORTD1-	CC. CC.CC.	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 666 345 CTC T        	G G G G G G 1111 6666 678 CAC         	1111 6777 9011 ACCC       	1111 7777 234 CCC  G G G G   	.C. .C. .C. .C. .C. 1111 7777 5677 .ATG         	1111 778 890 TAC         	1111 8888 123 TTC         	1111 888 456 TTC         	C C C C C C C 	G G G T T 9999 012 TCC T        	G G G G G G G G	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC         	222 000 234 TTT         		2222 001 890 GAC         	 2222 111 123 ATC       	C C C C C 2222 1111 4566 TGT         2222 1111 4566        222 2121 1111 4566 C C C C C C C	2222 1111 789 TTC         	 2222 2222 ACC .T .T. .T. .T. .T. .T. .T. .T. .T.	A A   2222 2222 2225 TCC  T       	2222 678 ACC       	2222 2333 901 ACC A A A A A A A	···· 2222 333 234 ATC G G G G G G G G.
GORILLA ORTD1-1 GORILLA ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4-2 HUMAN_ORTD1 LEMUR_ORTD4-2 GORILLA_ORTD4-1 RHESUS_ORTD4-2 GORILLA_ORTD4-1 RHESUS_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPANZEE_ORTD4 RHESUS_ORTD4 BONOBO_ORTD1 RHESUS_ORTD1 RHESUS_ORTD1-2 GORILLA_ORTD1-1 GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 LEMUR_ORTD4/ORTD1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 666 345 CTC T        	G G G G G G 1111 6666 678 CAC         	1111 677 901 ACC 	1111 7777 234 CCC G. G. G. G. C C C C C C C C C C C C	.C. .C. .C. .C. .C. 1111 7777 5677 ATG        2222 2555 345 345 ATT   	1111 778 890 TAC         	1111 888 123 TTC       	1111 888 456 7TC         	C C C C C C C 	G G G T T 9999 0122 T T       	G G G G G G G C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC         	2222 0000 234 TTT       		2222 0011 890 GAC       	 2222 1111 1233 ATC         	C C C C 2222 1111 4566         	2222 1111 789 TTC 		A A A C 2222 2223 345 7CC  TCC  A A A A A	2222 2222 678 ACC         	2222 233 901 A A A A A A A 	 222 333 234 C G G G G G G G G G
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 QRANGUTAN_OR7D4-2 QRANGUTAN_OR7D4-2 QRANGUTAN_OR7D4-2 GORILLA_OR7D4 CHIMPANZEE_OR7D4 CHIMPANZEE_OR7D4 CHIMPANZEE_OR7D4 PIGTAIL_OR7D1 RHESUS_OR7D4-1 QRANGUTAN_OR7D1-2 GORILLA_OR7D1 RHESUS_OR7D4-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1	C C C C C C C C	.T. .T. .T. .T. .T. .T. .T. .T. .T.  	1111 666 345 CTC T        	G G G G G G 1111 6666 678 CAC         	1111 677 901 ACC         	1111 777 234 CCC G. G. G. G. C C C C C C C C C C C C	.C. .C. .C. .C. .C. .C. 1111 7777 5667 ATG         	1111 778 890 TAC         	1111 888 123 TTC         	1111 888 456 TTC         	C C C C C C C 	G G G T G G T 9999 012 TCC T        	G G G G G G G C	C.G C.G C.G C.G C.G C.G C.G C.G C.G C.G	122 900 901 TCC         	222 000 234 TTT         		2222 0011 890 GAC         	 2222 1111 123 ATC       	C C C C 2222 1111 4566 TGT        2222 2111 4566 C C C C C C C	2222 111 789 TTC         	2222 2222 2222 ACC .T. .T. .T. .T. .T. .T. .T. .T. .T.	A A 2222 2222 2345 TCC  TCC       	2222 678 ACC         	2222 233 901 ACC .A .A .A .A .A .A .A .A .A .A .A .A .A	 222 333 234 ATC G G G G G G G G G G.

**Fig. 52.** Various alignments of all *OR7D4/OR7D1* alleles cloned. (*A*) Nucleotide alignment of the full ORF of *OR7D4/OR7D1* orthologs from 9 primate species. Both alleles of an individual are shown when the species is heterozygous for the gene. (*B*) Peptide alignment of the full ORF of *OR7D4* orthologs from 9 primate species and 7 reconstructed hypothetical ancestors. (*C*) Peptide alignment of the full ORF of *OR7D1* orthologs from 8 species. One allele per species is represented in the peptide alignment in (*B* and *C*). When the individual of a certain species is heterozygous for *OR7D4/OR7D1*, the intact, functional, and/or the most common allele is shown in (*B* and *C*).

ORANGUTAN_OR7D4-2 GORILLA_OR7D4 BONOBO_OR7D4 CHIMPANZEE_OR7D4 PIGTAIL_OR7D1 PIGTAIL_OR7D1 RHESUS_OR7D1-1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-2 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 HIMPANZEE_OR7D1-2 HIMPANZEE_OR7D1-2 HIMPANZEE_OR7D1-2	· · · · · · · · · · · · · · · · · · ·	 .G. .G. 		A A A A A A A 	A A A 				G	. 66 . 66 . 66 . 66 . 66 . 66 . 66 . 66	.T.	· · · · · · · · · · · · · · · · · · ·	····	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		G G G G G	G G G G G G G 		· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	G G G.G G.G. G.G. G.G. G.G. G.	· · · · · · · · · · · · · · · · · · ·		A A A A A A A A A A A A A
LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 GORLILA_OR7D4 BONOBO_OR7D4 BONOBO_OR7D4 PIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-2 GORLILA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 CHIMPANZEE_OR7D1-2 HIMPANZEE_OR7D1-2 HIMPANZEE_OR7D1-2	1111 345 ATG      	1111 6788 ATT G G G G G G G	···· ···· ···· ····	2222 234 GCT 	2222 567 GGA	223 890 CTG AC. A A A A A A A A A	333 123 GAT C 	333 456 AAT  .C. .C. .C. .C. .C. .C. .C. .C. .C	333 789 TTC 	444 012 CTCC A A A A A A A	444 345 CTG	$\begin{array}{c} 444 \\ 678 \\ ACC \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\ \\$	455 901 GTG     A A	5555 234 ATG         	5555 567 GCC         	556 890 TAT   	6666 123 GAC	6666 456 CGG T T 	666 789 TTT    	777 012 GTG    A  A	777 345 GCC	7777 678 ATC	788 901 TGC	888 234 CAC  T T      	8888 567 CCCC        	889 87T C C C C C C C C C C C C C C C C C
LEMUR OR7D4/OR7D1 COLOBUS OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 GORILLA_OR7D4 BONOBO_OR7D4 CHIMPANZEE OR7D4 HUMAN_OR7D1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1	999 123 CAC         	999 456 TAC	 .T. .T. .T. .T. .T.	000 012 GTC 	000 345 ATC	0000 678 ATG         	0111 9011 .AC .AC .AC .AC .AC .AC .AC .AC .AC .AC	1111 234 cccc     	1111 567 CGC .A. T T T T T T T T T	112 890 TTC C C C C C C C C C	222 123 TGT	222 456 GCC .G. .G. .G. .G. .G. .G. .G. .G. .G.	2222 789 CTC       	333 012 CTG 	333 345 GTT 	333 678 CTC CG G G G G G G G	3444 901 ATG GCA GCA GCA GCA GCA GCA GCA GCA GCA GC	444 234 TCT         	444 567 TGG	445 890 TTC  .A.   	555 123 ATC  G G G G   	5555 456 ATG T T T T T T T T T	555 789 TCC GT. .T. .T. .T. .T. .T. .T. .T. .T. .T.	6666 012 CTG TG. TG. TG. TG. TG. TG. TG. TG. TG. T	6666 345 GTTC C TC TC TC TC TC TC C C C C C C C TC C TC C TC C	666 678 GCC. T T T T T T T T T
LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 GORILLA_OR7D4-2 GORILLA_OR7D4 HUMAN_OR7D4 PIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-2 BONOBO_OR7D1-2 CHIMEANZEE_OR7D1-1	677 901 CTG   	777 234 GTT   	444 7777 567 CAT	778 890 GTA A.T. C.T.T.A.T.A.T.A.A.A.T.A.A.A.T.A.A.A.T.A.A.A.T.A.A.A.T.A.A.A.T.A	888 123 CTA	888 456 CTG	888 789 ACA .TG .TG .TG .TG .TG .TG .TG .TG .TG .TG	999 012 TTG AA. AA. AA. AA. AA. AA. AA. AA. AA. AA	9999 345 AGG         	9999 678 CTG T T T T T T T T T C C	900 901 ACC G G G	0000 234 TTC 	0000 567 TCT C C C C C C C	0011 8900 TTA AC. AC. AC. AC. AC. AC. AC. AC. AC. AC	1111 123 GAA .GC .GC .GC .GC .GC .GC .GC .GC .GC .GC	1111 456 ACT C   C C C C	1111 789 GAA G G.G G G G G G G G	222 012 ATC T T T T T T T T T	222 345 CCA C C C C G G G	222 678 CAT 	233 901 TTC 	333 234 TTC 	333 567 TGT  .A. .A. 	334 890 GAC A A A A A A A A A	444 123 CTG G G C C C C C	444 456 GCT      

Fig. S2. Continued.

PNAS PNAS

HUMAN_OR7D1																										
LEMUR OR7D4/OR7D1 COLOBUS OR7D4 PIGTAIL OR7D4-1 PIGTAIL OR7D4-2 RHESUS OR7D4-2 RHESUS OR7D4-2 ORANGUTAN OR7D4-1 ORANGUTAN OR7D4-1 ORANGUTAN OR7D4-1 GORILLA OR7D4 PIGTATL OR7D1 RHESUS OR7D1 ORANGUTAN OR7D1-1 GORILLA OR7D1-1 GORILLA OR7D1-1 BONOBO OR7D1-1 BONOBO OR7D1-1 BONOBO OR7D1-1 HUMPANZEE OR7D1-2 HUMAN_OR7D1	789 CAG      	552 3 ATT C C C C C C C C C C C C C C C C C C	555 345 CTC	678 GAG	5666 901 GTG A A A A A A A	666 234 GCC   	6666 567 TGC C CA. C C C C CA. CA. CA. CA	667 890 TCT	777 123 GAC T A A A A A A A	7777 456 ACC  T T      	7777 789 CTC G 	888 012 ATC C C.T C C C C C C	888 345 AAT GT. GT.  GT. GT.     	888 678 AAC	899 901 ATC         	$\begin{array}{c} 9999\\ 234\\ TGC\\ AT.\\ GT.\\ GT.\\ GT.\\ GT.\\ GT.\\ GT.\\ GT.\\ G$	999 567 T T T T T T T T.	9900 8900 TAC T T T T T T T T T 	$\begin{array}{c} 0000\\ 123\\ TTG\\ G..\\ G$	000 456 TTG GCC GCC GCC GCC GCC GCC GCC GCC GCC	0000 789 ACT G G G G G G G G G 	1111 012 GTG GTG .CA .CA .CA .CA .CA .CA .CA .CA .CA .CA	1111 345 TTG C C C C C C C	1111 678 CTG     	122 901 GGT	222 234 GTG         
		666																								
		223 890																								
LEMUR_OR7D4/OR7D1 COLOBUS OR7D4		CCT																								
PIGTAIL OR7D4-1																										
PIGTAIL OR7D4-2																										
RHESUS_OR7D4-1 RHESUS_OR7D4-2																										
ORANGUTAN_OR7D4-1				G.T																						
ORANGUTAN_OR7D4-2 GORILLA OR7D4				G.T G.T																						
BONOBO OR7D4				G.T																						
CHIMPANZEE_OR7D4 HUMAN OR7D4				G.T G.T																						
PIGTAIL_OR7D1 RHESUS OR7D1		• • •		G.T G.T																						
ORANGUTAN_OR7D1-1			A	G.T								C.G	C						A				C	.AG		
ORANGUTAN OR7D1-2 GORILLA OR7D1-1		•••		G.T G.T																						
GORILLA OR7D1-2				G.T								C.G							A				c	.AG		
												~ ~	~										C	220		
BONOBO_OR7D1-1			A																							
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1	· · ·		А АА	G.T G.T	· · ·	· · · ·	· · ·	· · ·	· · ·		· · ·	C.G C.G	c c	· · · ·	· · · ·		•••	· · ·	A G.A	· · ·	· · · ·	· · ·	c c	. AG . AG	· · ·	· · · · · · ·
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	···· ···		A A AA	G.T G.T G.T	 	 	· · · · · · ·	 	· · · · · · ·	 	···· ···	C.G C.G C.G	c c c	 	 	 	· · · · · · ·	 	A G.A G.A	 	 	 	c c c	.AG .AG .AG	 	· · · · · · ·
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1	 	···· ····	A AA A A	G.T G.T G.T G.T	 	 	· · · · · · · ·	 	 	  	 	C.G C.G C.G C.G	c c c	 	  	 	  	 	A G.A G.A A	 	 	 	c c c c	. AG . AG . AG . AG	 	  
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	   777		A A A A 777	G.T G.T G.T G.T 777	   777	   777	   777	   777	   777	   777	  	C.G C.G C.G C.G	c c c 	   777	· · · · · · · · · ·	   777	   777	  	A G.A G.A A 777	  	   777	   777	c c c c	.AG .AG .AG .AG 777	   777	   777
BONOBO ORTDI-1 BONOBO ORTDI-2 CHIMPANZEE ORTDI-1 CHIMPANZEE ORTDI-1 CHIMPANZEE ORTDI-2 HUMAN_ORTDI	  777 000 345	  777 000 678	A A A A 7777 011 901	G.T G.T G.T 777 111 234	  777 111 567	  777 112 890	  777 222 123	  777 222 456	  777 222 789	  777 333 012	  777 333 345	C.G C.G C.G 777 333 678	C C  777 344 901	  777 444 234	  777 444 567	  777 445 890	  777 555 123	  777 555 456	A G.A G.A A 777 555 789	  777 666 012	  777 666 345	  777 666 678	C C C 777 677 901	.AG .AG .AG .AG 777 777 234	  777 777 567	  777 778 890
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	  777 000 345 AAT	   777 000	A A A A 7777 011 901 GCA	G.T G.T G.T G.T 777 111 234 TTT	  777 111 567 TCC	  777 112 890 ACC	  777 222 123 TGT	  777 222 456 GGG	  777 222 789 TCT	  777 333 012 CAC	  777 333 345 CTC	C.G C.G C.G 777 333 678 TGT	C C  777 344 901 GTG	 777 444 234 GTC	 777 444 567 TGC	  777 445 890 TTG	  777 555 123 TTC	 777 555 456 TAT	A G.A G.A A 777 555 789 GGA	  777 666 012 ACA	  777 666 345 GGA	  777 666 678 GTT	C C C 777 677 901 GGG	.AG .AG .AG .AG 777 777 234 GTC	  777 777 567 TAC	  777 778 890
BONOBO ORTDI-1 BONOBO ORTDI-2 CHIMPANZEE ORTDI-2 CHIMPANZEE ORTDI-2 HUMAN_ORTDI-2 HUMAN_ORTDI-2 HUMAN_ORTDI LEMUR_ORTD4/ORTDI COLOBUS_ORTD4 PIGTAIL_ORTD4-1	 777 000 345 AAT T.C T.C	777 000 678 AAA G	A A A A 7777 011 901 GCA C C	G.T G.T G.T 777 111 234 TTT 	 777 111 567 TCC 	  777 112 890 ACC 	777 222 123 TGT	 777 222 456 GGG 	 777 222 789 TCT 	 777 333 012 CAC 	 777 333 345 CTC 	C.G C.G C.G 777 333 678 TGT 	C C C 777 344 901 GTG 	 777 444 234 GTC 	 777 444 567 TGC .C. .C.	 777 445 890 TTG 	 777 555 123 TTC 	 777 555 456 TAT 	A G.A G.A A 777 555 789 GGA 	777 666 012 ACA	777 666 345 GGA	  777 666 678 GTT C C	C C C 777 677 901 GGG 	. AG . AG . AG . AG 777 777 234 GTC 	777 777 777 567 TAC T	777 778 890 CTC
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPARZEE_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1-2 HUMAN_OR7D1-2 HUMAN_OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1	 777 000 345 AAT T.C T.C	777 000 678 AAA G	A A A A 7777 011 901 GCA C C	G.T G.T G.T 777 111 234 TTT 	777 111 567 TCC 	 777 112 890 ACC 	 777 222 123 TGT 	777 222 456 GGG	777 222 789 TCT	777 333 012 CAC	 777 333 345 CTC 	C.G C.G C.G 777 333 678 TGT 	C C C 777 344 901 GTG 	 777 444 234 GTC 	777 444 567 TGC .C. .C.	777 445 890 TTG 	 777 555 123 TTC 	 777 555 456 TAT 	A G.A G.A A 777 555 789 GGA 	777 666 012 ACA	777 666 345 GGA	  777 666 678 GTT C C	C C C 777 677 901 GGG 	.AG .AG .AG 777 777 234 GTC 	777 777 777 567 TAC T	777 778 890 CTC
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_CR7D1 LEMUR_OR7D4/OR7D1 COLOBUS OR7D4 PIGTAIL_OR7D4-2 RHESUS_OR7D4-2	 777 000 345 AAT T.C T.C T.C T.C	777 000 678 AAA G	A A A 7777 011 901 GCA C C C C	G.T G.T G.T 777 111 234 TTT  	777 111 567 TCC 	 7777 112 890 ACC 	777 222 123 TGT 	777 222 456 GGG 	777 222 789 TCT 	777 333 012 CAC	777 333 345 CTC	C.G C.G C.G 777 333 678 TGT  	C C  777 344 901 GTG  	777 444 234 GTC 	777 444 567 TGC .C. .C. .C. .C. .C.	 777 445 890 TTG 	777 555 123 TTC 	777 555 456 TAT 	A G.A G.A A 7777 555 789 GGA  	777 666 012 ACA	777 666 345 GGA 	 777 666 678 GTT C C C C C	C C C 777 677 901 GGG  	.AG .AG .AG 777 777 234 GTC  	777 777 777 567 TAC T T T	777 778 890 CTC
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 UEMUR_OR7D4-0 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2	 777 000 345 AAT T.C T.C T.C T.C T.C T.C	777 000 678 AAA G	A A A A 777 011 901 GCA C C C C	G.T G.T G.T 777 111 234 TTT  	777 111 567 TCC  	 7777 112 890 ACC 	777 222 123 TGT 	777 222 456 GGG 	777 222 789 TCT 	777 333 012 CAC	777 333 345 CTC 	C.G C.G C.G 777 333 678 TGT  	C C C 777 344 901 GTG  	777 444 234 GTC  	 777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	777 445 890 TTG 	777 555 123 TTC 	 777 555 456 TAT   A	A G.A G.A 777 555 789 GGA 	777 666 012 ACA	777 666 345 GGA 	 777 666 678 GTT C C C C C C.A C.A	C C 777 677 901 GGG 	. AG . AG . AG . AG 777 777 234 GTC   	777 777 567 1AC .T .T .T .T .T	777 778 890 CTC 
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1	 777 000 345 AAT T.C T.C T.C T.C T.C T.C	777 000 678 AAA G	A A A A 777 011 901 GCA C C C C C	G.T G.T G.T 777 111 234 TTT  	777 111 567 TCC  	777 112 890 ACC  	777 222 123 TGT	777 222 456 GGG   	777 222 789 TCT 	777 333 012 CAC	777 333 345 CTC 	C.G C.G C.G 777 333 678 TGT  	C C C 777 344 901 GTG  	777 444 234 GTC  	777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C.	777 445 890 TTG  	777 555 123 TTC 	777 555 456 TAT  A A	A G.A G.A 777 555 789 GGA 	777 666 012 ACA 	777 666 345 GGA	777 666 678 GTT C C C C C C.A C.A C	C C 777 677 901 GGG 	. AG . AG . AG . AG 777 777 234 GTC 	777 777 567 1AC .T .T .T .T .T .T	777 778 890 CTC   
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 UMAN_OR7D1 UMAN_OR7D1 DIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2	777 0000 3455 AAT T.C T.C T.C T.C T.C T.C T.C T.C T.C T.	777 000 678 AAA G.	A A A A A 7777 011 901 GCA C C C C C C C C C	G.T G.T G.T G.T 7777 1111 234 TTT   	7777 1111 5677 TCC 	7777 112 8900 ACC  	777 222 123 TGT  	7777 2222 456 GGG       	7777 2222 789 TCT	7777 3333 012 CAC	7777 3333 345 CTC	C.G C.G C.G 777 333 678 TGT  	C C C 7777 3444 901 GTG GTG 	 7777 444 234 GTC  	777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 8900 TTG 	 7777 5555 123 TTC  	777 555 456 TAT  A A A	A G.A G.A A 777 555 789 GGA  	7777 6666 012 ACA	777 666 345 GGA	777 666 678 GTT C C C C C C C C C C	C C 7777 6777 9011 GGG  	. AG . AG . AG . AG 7777 234 GTC     	 777 777 567 TAC T T T T T T T T	777 778 890 CTC       G
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4 BONOBO OR7D4 BONOBO OR7D4 CHIMPANZEE OR7D4 HUMAN_OR7D4	777 000 345 AAT T.C T.C T.C T.C T.C T.C T.C T.C T.C T.	777 000 678 AAA G.	A A A A A 777 011 901 GCA C C C C C C C C C	G.T G.T G.T G.T 7777 1111 234 TTT   	7777 1111 5677 TCC 	7777 112 8900 ACC 	7777 222 123 TGT 	7777 2222 456 GGG       	7777 222 789 TCT 	7777 333 012 CAC	7777 3333 345 CTC	C.G C.G C.G C.G 7777 3333 678 TGT  	C C C      	7777 444 234 GTC	7777 444 5677 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 TTG 	7777 5555 123 TTC 	7777 5555 4566 TAT  A A		7777 6666 0122 ACA	7777 6666 345 GGA	 7777 6666 678 GTT C C C C C C C	C C C 7777 6777 9011 GGG  	. AG . AG . AG . AG 7777 7234 GTC  	 7777 7567 TACC T T T T T T T T T	777 778 890 CTC       G G
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPARZEE_OR7D1-2 CHIMPARZEE_OR7D1-2 HUMAN_OR7D1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 DICTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-2 GORILLA_OR7D4-2 GORILLA_OR7D4-2 GORILLA_OR7D4-2 GORILLA_OR7D4 BONOBO_OR7D4 CHIMPANZEE_OR7D4 PIGTATL_OR7D1 PIGTATL_OR7D1 RHESUS_OR7D1	777 000 345 T.C T.C T.C T.C T.C T.C T.C T.C T.C T.C	777 000 678 AAA G	A A A A A 777 011 901 GCA C C C C C C C C C	G.T G.T G.T G.T G.T 7777 1111 234 TTT    	7777 1111 567 TCC 	7777 1122 890 ACC 	7777 2222 1233 TGT 	7777 2222 456 GGG         	7777 2222 789 TCT 	7777 3333 012 CAC	7777 3333 345 CTC 	C.G C.G C.G C.G 7777 3333 678 TGT   	C C C  7777 344 901 GTG    	7777 444 234 GTC 	7777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 4455 890 TTG 	7777 5555 1233 TTC 	7777 5555 456 TAT  A A A	A G.A G.A A 7777 5555 7899 GGA  	7777 6666 012 ACA	7777 6666 345 GGA	777 666 678 GTT C C C C C C C C C C	C C C C 7777 6777 901 GGG   	. AG . AG . AG . AG . AG 777 777 234 GTC 	777 777 567 777 567 777 777 777 777 777	777 778 890 CTC         
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CIDOBUS OR7D4 PIGTAIL OR7D4-1 PIGTAIL OR7D4-1 PIGTAIL OR7D4-1 RHESUS OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4 CHIMPANZEE OR7D4 CHIMPANZEE OR7D4 PIGTAIL OR7D4 PIGTAIL OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1	777 000 345 AAT T.CC T.CC T.CC T.CC T.CC T.CC T.CC	777 000 678 AAA G.	A A A A A A 7777 0111 9011 GCA C C C C C C C C C	G.T G.T G.T G.T 777 111 234 TTT   	7777 1111 567 TCC	7777 112 890 ACC 	7777 2222 123 TGT	7777 2222 456 GGG       	7777 2222 789 TCT	7777 333 012 CAC	7777 3333 345 CTC	C.G C.G C.G C.G T777 333 678 TGT  	C C C      	777 444 234 GTC	7777 444 5677 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 TTG 	7777 5555 123 TTC 	7777 5555 456 TAT  A A A A A	A G. A G. A A 777 555 789 GGA   	7777 6666 012 ACA	7777 6666 345 GGA	 7777 6666 678 GTT C C C C C C C	C C C C 7777 6777 901 GGG   	. AG . AG . AG . AG 7777 7777 234 GTC 	 7777 7777 5667 TAC T T T T T T T T T 	777 778 890 CTC         
BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPARZEE_OR7D1-2 CHIMPARZEE_OR7D1-2 HUMAN_OR7D1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 DICTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-2 GORIULA_OR7D4-2 GORILLA_OR7D4 CHIMPANZEE_OR7D4 BONOBO_OR7D4 CHIMPANZEE_OR7D4 HUMAN_OR7D4 PIGTATL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-1	777 000 345 T.CC T.CC T.CC T.CC T.CC T.CC T.CC T.C	777 000 678 AAA G. 	A A A A A A A A A A	G.T G.T G.T G.T T T 111 234 T T T     	777 111 567 TCC	7777 1122 8900 ACC  	7777 2222 1233 TGT	7777 2222 456 GGG       	7777 2222 789 TCT	7777 3333 012 CAC	7777 3333 345 CTC 	C.G C.G C.G C.G 7777 3333 6788 TGT  	C C C  344 901 GTG    	7777 4444 234 GTC	7777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 TTG 	7777 5555 123 TTC  	7777 5555 4566 TAT  A A A A A A	A G.A G.A G.A A 7777 5555 7899 GGA   	7777 6666 012 ACA	7777 666 345 GGA	 7777 6666 6788 GTT C C C C C C C	C C C 7777 6777 9011 GGG   	. AG . AG . AG . AG 777 777 234 GTC  	 777 777 567 TAC T T T T T T T T T 	777 778 890 CTC         
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 PICTAILOR7D4-1 PICTAILOR7D4-1 PICTAILOR7D4-1 PICTAILOR7D4-1 RHESUS OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4 CHIMPANZEE OR7D4 BONOBO OR7D4 CHIMPANZEE OR7D4 PICTAILOR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-2 GORILLA_OR7D1-2	 777 0000 345 T.CCT.CCT.CC T.CCT.CCT.CC T.CCT.CCT.CC T.CCT.CC	7777 0000 678 AAA G	A A A A A A A 777 0111 9011 GCA CC CC CC CC CC CC CC	G.T G.T G.T G.T 777 111 234 TTT     	7777 1111 5677 TCCC	7777 1122 8900 ACCC  	7777 2222 123 TGT 	7777 2222 4566 GGG       	7777 2222 789 TCT 	7777 3333 012 CAC 	7777 333 345 CTC 	C.G C.G C.G C.G 7777 333 678 TGT   	C C C      	7777 444 234 GTC	7777 4444 5677 TGCC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 TTG 	7777 5555 1233 TTC    	7777 5555 4566 TAT  A A A A A A	A G.A G.A A 7777 5555 789 GGA    	7777 6666 012 ACA	7777 6666 345 GGA	 7777 6666 6788 GTT C C C C C C C	C C C 7777 6777 9011 GGG   	. AG . AG . AG . AG 777 777 234 GTC  	 7777 7567 TACC T T T T T T T	 777 778 890 CTC       
BONOBO ÖR7D1-1 BONOBO ÖR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 GORILLA_OR7D4 HUMAN_OR7D4 BONOBO_OR7D4 HUMAN_OR7D4 PIGTAIL_OR7D1 CHIMPANZEE OR7D4 HUMAN_OR7D4 PIGTAIL_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-2 BONOB0_OR7D1-2	777 0000345 T.CCT.CCT.CCT.CCT.CCT.CCT.CCCTT.CCCTT.CCCTT.CCCTT.CCCCCTT.CCCTT.CCCTT.CCCTT.CCTTT.CCTTT.CCTTT.CCTTT.CCTTT.CCTTT.CCTTT.CCTTT.CCTTTT.CCTTTT.CCTTTT.CCTTTTCCTTTT	777 000 678 AAA G 	A A A A A A A A A A	G.T G.T G.T G.T 777 111 234 TTT   	7777 1111 567 TCC	7777 1122 8900 ACC 	7777 2222 1233 TGT	7777 2222 456 GGG         	7777 2222 789 TCT 	7777 3333 012 CAC	7777 3333 345 CTC 	C.G C.G C.G T777 333 678 TGT   	C C C      	777 444 234 GTC	7777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 TTG 	7777 5555 123 TTC 	7777 5555 4566 TAT A A A A A A A	A G.A G.A A 7777 5555 789 GGA     	777 666 012 ACA	7777 666 345 GGA	 7777 6666 678 GTT C C C C C C C	C C C 7777 6777 901 GGG  	. AG . AG . AG . AG 777 777 234 GTC  	 777 777 567 TAC T T T T T T T T T 	 7777 778 8900 CTC       
BONOBO ORTDI-1 BONOBO ORTDI-2 CHIMPANZEE ORTDI-2 CHIMPANZEE ORTDI-2 CHIMPANZEE ORTDI-2 HUMAN_ORTDI COLOBUS ORTD4-2 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 RHESUS_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-1 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPANZEE ORTD4 DIGTAIL_ORTD1-2 GORILLA_ORTD1-2 BONOBO_ORTD1-2 BONOBO_ORTD1-2 EONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2		777 000 678 AAA G. 	A A A A A A A A A A	G.T G.T G.T G.T 7777 111 234 TTT   	7777 1111 5677 TCCC	7777 112 890 ACC	7777 2222 123 TGT	7777 2222 4566 GGG        	7777 2222 7899 TCT	7777 3333 012 CAC	777 333 345 CTC	C.G C.G C.G T777 333 678 TGT  	C C C      	777 444 234 GTC	7777 4444 567C C.C. CC. CC. CC. CC. CC. CC. CC. CC.	7777 445 8900 TTG 	7777 5555 123 TTC 	7777 5555 4566 TAT  A A A A A A	A G.A G.A A 777 5555 789 GGA   	777 666 012 ACA	777 666 345 GGA	 7777 6666 678 GTT C C C C C C C	C C C 7777 6777 9011 GGG   	. AG . AG . AG . AG 777 777 234 GTC  	 7777 7567 T T T T T T T 	 7777 778 8900 CTC       
BONOBO ÖR7D1-1 BONOBO ÖR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 GORILLA_OR7D4 HUMAN_OR7D4 BONOBO_OR7D4 HUMAN_OR7D4 PIGTAIL_OR7D1 CHIMPANZEE OR7D4 HUMAN_OR7D4 PIGTAIL_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-2 BONOB0_OR7D1-2	777 00003 AAT T.CC T.CC T.CC T.CC T.CC T.CC T.CC	777 000 678 AAA G. 	A A A A A A 777 0111 901 GCA C C C C C C C C C	G.T G.T G.T G.T 777 111 234 777  	7777 111 567 TCC	7777 1122 8900 	7777 2222 123 TGT 	7777 2222 4566 GGG       	7777 2222 789 TCT 	7777 333 012 CAC	7777 333 345 CTC	C.G C.G C.G 777 333 678 TGT 	C C C  901 901     	777 444 234 GTC	7777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 	7777 555 123 TTC 	7777 5555 456 TAT  A A A A A A	A G.A G.A A 7777 5555 7899 GGA   	7777 666 012 ACA	7777 666 345 GGA	7777 6666 GTT C C C C C C C	C C C 7777 901 6777 901 6777 901  	. AG . AG . AG . AG 777 777 234 GTC 	 7777 567 567 T T T T T T T 	 777 778 890 CTC       
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 DICTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-2 GORILLA_OR7D4 BONOBO_OR7D4 CHIMPANZEE OR7D1-1 GORILLA_OR7D1 RHESUS_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1	 777 0345 AAT T.CCCTT.CCCT T.CCCCTT.CCCT T.CCCCTTT.CCCTTT.CCC T.CCCCTTT.CCCTTT.CCC	777 000 678 AAA G 	A A A A A A A 777 0111 9011 C C C C C C C C C	G.T G.T G.T G.T 7777 111 234 TTT      	7777 1111 567 TCC	777 112 890 ACC 	7777 2222 123 TGT	7777 2222 456 GGG         	7777 2222 789 TCT	7777 333 012 CAC 	7777 3333 345 CTC	C.G C.G C.G C.G T777 333 678 TGT  	C C C  344 901 GTG   	7777 4444 GTC	7777 444 567 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 4455 890 TTG 	7777 5555 123 TTC 	7777 5555 456 TAT  A A A A A 	A G.A G.A A 7777 5555 789 GGA 	7777 6666 012 ACA	7777 6666 345 GGA	 7777 6666 678 GTT C C C C C C C	C C C C 901 GGG  	. AG . AG . AG 777 777 234 GTC 	 7777 7567 TAC T T T T T T T	777 778 890 CTC         
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 DICTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-2 GORILLA_OR7D4 BONOBO_OR7D4 CHIMPANZEE OR7D1-1 GORILLA_OR7D1 RHESUS_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1		777 000 678 AAA G.        	A A A A A A A A A A	G.T G.T G.T G.T 7777 1111 234 TTT         	7777 1111 567 TCC 	7777 1122 8900 ACC       	7777 2222 123 TGT 	7777 2222 4566 GGG  A A A A A A A A	7777 2222 789 TCT 	7777 333 012 CAC       	7777 3333 345 CTC 	C.G C.G C.G T777 333 678 TGT         	C C C      	7777 4444 GTC 	77774444 5677 TGCC .CCCCCCCCC	7777 4455 890 TTG       	7777 5555 123 TTC       	7777 5555 4566 TAT  A A A A A A	A G.A G.A A 7777 5555 789 GGA       	7777 666 012 ACA	7777 6666 345 GGA	 7777 6666 6788 GTT C C C C C C C	C C C 7777 6777 9011 GGG      8888 4444	. AG . AG . AG . AG 7777 7234 GTC         	 7777 5567 TACC T T T T T T T T T	 7777 778 890 CTC       
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D4-2 HUMAN_OR7D1	777 770 345 AAT T.CCT.CCT.CT.CCT.CT.CCT.CCT.CCT.CCT.CC	777 000 678 AAA G.        	A A A A A A C C C C	G.T G.T G.T G.T G.T 7777 1111 2344 TTT         7777 99902	7777 1111 567 TCC       	7777 112 8900 ACC       	7777 2222 1233 TGT       	7777 2222 456 GGG       	7777 2222 789 TCT       	7777 333 012 CAC       	7777 3333 345 CTC       	C.G C.G C.G T777 333 6788 TGT         	C C C      	777 444 234 GTC         	7777 444 5677 TGCC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 TTG         	7777 5555 123 TTC       	7777 5555 4566 TAT  A A A A A A	A G.A G.A G.A A 7777 5555 789 GGA        8888 333 3567	7777 6666 012 ACA       	7777 6666 345 GGA       	 7777 6666 6788 GTT C C C C C C C	C C C 7777 6777 9011 GGGG      8888 8444 789	. AG . AG . AG . AG . AG . AG . AG . C . C . C . C . C . C . C . C . C . C	 7777 5667 TACC   	 777 778 890 CTC         
BONOBO ÖR/D1-1 BONOBO ÖR/D1-2 CHIMPANZEE OR/D1-2 CHIMPANZEE OR/D1-2 CHIMPANZEE OR/D1-2 HUMAN_OR/D1 LEMUR_OR/D4 PIGTAIL_OR/D4-1 PIGTAIL_OR/D4-1 PIGTAIL_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 DICATAIL_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D4-2 ORANGUTAN_OR/D1-1 ORANGUTAN_OR/D1-1 BONOBO_OR/D1-2 CHIMPANZEE_OR/D1-2 CHIMPANZEE_OR/D1-2 CHIMPANZEE_OR/D1-2 HUMAN_OR/D4 LEMUR_OR/D4/OR/D1 COLOBUS_OR/D4	777 000 345 T.CC T.CC T.CC T.CC T.CC T.CC T.CC T.C	7777 000 678 AAA G        	A 	G.T G.T G.T 777 111 234 4 TTT        	7777 1111 5677 TCC 	7777 112 890 ACC       	7777 2222 1233 TGT       	7777 2222 4566 GGG        	7777 2222 789 TCT       	7777 3333 012 CAC       	7777 333 345 CTC         	C.G C.G C.G C.G T777 333 678 TGT         	C C C  7777 3444 901 GTG        8888 111 7899 ATT G	7777 4444 234 GTC         	7777 4444 5677 TGC .C .C .C .C .C .C .C	7777 445 890 TTG         	7777 5555 123 TTC       	7777 5555 4566 TAT A A A A A A A	A G.A G.A G.A A 7777 5555 7899 GGA C C C C 8888 3333 5677 ACG6 C	7777 6666 012 ACA       	7777 6666 345 GGA         	7777 6666 678 GTT C C C C C C C	C C C 7777 6777 9011 GGG      8888 8444 7899 CCC	. AG . AG . AG . AG . AG . AG . AG . AG	7777 7777 5677 	 777 778 890 CTC         
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 HUMPANZEE OR7D1-2 HUMPANZEE OR7D1-2 HUMPANZEE OR7D1-2 HUMPANZEE OR7D1-2 HUMPANZEE OR7D1-2 HUMPANZEE OR7D1-2 HUMAN_OR7D1	777 000 3455 AAT T.CC T.CC T.CC T.CC T.CC T.CC T.CC	777 000 678 AAA G.        	A A A A A A A 	G.T G.T G.T G.T T T T T T T T T T T T T	7777 1111 5677 TCC 	7777 1122 890 ACC         	7777 2222 1233 TGT       	7777 2222 4566 GGG        	7777 2222 7899 TCT 	7777 333 012 CAC       	7777 3333 345 CTC         	C.G C.G C.G C.G TGT 3333 678 TGT         	C C C      	7777 444 234 GTC	777 444 567 C. C. C. C. C. C. C. C. C. C. C. C. C.	7777 445 8900 TTG       	7777 5555 1233 TTC 	7777 5555 4566 TAT  A A A A A A	A G.A G.A G.A 7777 5555 7899 GGA C C 8888 333567 ACGG C	7777 6666 0122 ACA       	7777 6666 3453 GGA       	 7777 6666 6788 GTT C C C C C C C	C C C 7777 6777 9011 GGG      8484 4789 CCC 	. AG . AG . AG 7777 7777 234 GTC         	7777 75677 TACC .T .T .T .T .T .T .T .T .T .T .T	 777 778 890 CTC         
BONOBO ÖR7D1-1 BONOBO ÖR7D1-1 CHIMPÄNZEE OR7D1-2 CHIMPÄNZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4 BONOBO ÖR7D4-2 ORANGUTAN_OR7D4 HUMAN_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D1-2 BONOBO_OR7D1-2 GORILLA_OR7D1-2 BONOBO_OR7D1-2 CHIMPÄNZEE OR7D1-2 CHIMPÄNZEE OR7D1-2 HUMAN_OR7D4 BONOBO_OR7D1-2 HUMAN_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1	777 000 345 T.CC T.CC T.CC T.CC T.CC T.CC T.CC T.C	7777 000 678 AAA G        	A A A A A A A 	G.T G.T G.T G.T 777 111 234 TTT         	7777 1111 5677 TCC 	7777 112 890 ACC       	7777 2222 1233 TGT 	7777 2222 4566 GGG        	7777 2222 7899 TCT 	7777 3333 012 CAC 	7777 3333 345 CTC 	C.G C.G C.G C.G TGT 333 678 TGT         	C C C      	7777 444 234 GTC         	7777 4444 5677 TGC .C. .C. .C. .C. .C. .C. .C. .C. .C.	7777 445 890 TTG         	7777 5555 1233 TTC 	7777 5555 4566 TAT  A A A A A A	A G.A G.A G.A 7777 5555 7899 GGA C C C C CC CC	7777 6666 0122 ACA       	7777 6666 345 GGA         	7777 6666 678 GTT C C C C C C C	C C C 7777 6777 9011 GGG      8888 8444 7899 CCC 	. AG . AG . AG . AG . AG . AG . AG . AG	7777 75677 7777 7777 7777 7777 7777 777	 777 778 890 CTC         
BONOBO OR7D1-1 BONOBO OR7D1-2 CHIMPANZEE OR7D1-2 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 CHIMPANZEE OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4 PIGTAIL_OR7D4 PIGTAIL_OR7D1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 HUMPANZEE_OR7D4-2 CHIMPANZEE_OR7D4-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4-1 PIGTAIL_OR7D4-1	777 0003455 T.CCCTT.CCTT.CCTT.CCTT.CCTT.CCTT.CCTT	777 000 678 AAA G.        	A A A A A A A 	G.T G.T G.T G.T T T T T T T T T T T T T	7777 1111 5677 TCC         	7777 1122 8900 ACC         	7777 2222 123 TGT       	7777 2222 4566 GGGG        	7777 2222 7899 TCT 	7777 3333 012 CAC         	7777 3333 345 CTC         	C.G C.G C.G C.G TGT        	C C C 7777 3444 901 GTG         	7777 444 GTC         	7777 4444 5677 CC. CC. CC. CC. CC. CC. CC. CC. CC. C	7777 445 890 TTG       888 2222 678 2222 678 2222 678 2222 676 7	7777 5555 123 TTC       	7777 5555 4566 TAT  A A A A A A	A G.A G.A A 7777 5555 7899 GGA         	7777 6660 012 ACA         	7777 6666 345 GGA         	7777 6666 678 C C C C C C C C.	C C C 7777 6777 901 C C C C C C C 	. AG . AG . AG . AG 7777 7234 GTC         	7777 7567 7777 567 7777 7777 7777 7777	 777 778 890 CTC         

Fig. S2. Continued.

PNAS PNAS

GORILLA OR7D4					c	Δ						тC	G		Δ				c c	Δ						
BONOBO OR7D4																										
CHIMPANZEE OR7D4																										
HUMAN OR7D4						.A.																				
PIGTAIL OR7D1					c																					
RHESUS OR7D1					C	.A.						TC.	G		A				c	Α						
ORANGUTAN_OR7D1-1																										
ORANGUTAN_OR7D1-2					C																					
GORILLA_OR7D1-1	· · ·																									
GORILLA_OR7D1-2		• • •																								
BONOBO OR7D1-1	• • •	• • •																								
BONOBO_OR7D1-2 CHIMPANZEE OR7D1-1	• • •	• • •			c											•••							• • •	• • •	• • •	
CHIMPANZEE_OR7D1-2																							• • •	• • •	• • •	• • •
HUMAN OR7D1					c																					
—																										
	888	888	888	888	888	888	888	888	888	888	888	888	888	889	999	999	999	999	999	999	999	999	999	999	999	999
		666																								
		234																								
LEMUR_OR7D4/OR7D1	CCC	TTC	ATC																							
COLOBUS_OR7D4	• • •																									.CA
PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-2																G										.c.
RHESUS OR7D4-1																G										.CA
RHESUS OR7D4-2																G										CA
ORANGUTAN OR7D4-1																.A.										. CA
ORANGUTAN OR7D4-2																.A.										.CA
GORILLA OR7D4						с	.G.									.A.		C			.GG	G.C	.A.		т	.CA
BONOBO_OR7D4						с										.A.										.CA
CHIMPANZEE_OR7D4						с										.A.										.CA
HUMAN_OR7D4																										.CA
PIGTAIL_OR7D1		• • •																								
RHESUS_OR7D1		• • •																								
ORANGUTAN_OR7D1-1 ORANGUTAN OR7D1-2		•••														G										c
	• • •	• • •																								
GORILLA_OR7D1-1						с	.G.									G		C	т		.GG	G			Т	C
GORILLA_OR7D1-1 GORILLA_OR7D1-2			· · · · · · ·		· · ·	с с	.G. .G.	· · ·	· · ·	· · ·	· · ·	· · ·	· · ·		· · ·	G G	· · ·	c c	Т Т	· · · · · ·	. GG . GG	G G	 	 	т т	
GORILLA_OR7D1-1	· · ·			 	 	с с	.G. .G. .G.				 		 		 	G G		c c c	T T T	 	. GG . GG . GG	G G G	 		T T T	c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1	 	···· ···· ···	· · · · · · · ·	· · · · · · · ·	 	c c c c	.G. .G. .G. .G.					 	  A		 	G G G		c c c c	T T T	 	. GG . GG . GG . GG	G G G G		  .т.	T T T	c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	  	  	  	· · · · · · · · · · · ·	· · · · · · · · · · · ·	C C C C C	.G. .G. .G. .G. .G.	· · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · ·		· · · · · · · · · · · ·	· · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	c c c c c	T T T T T	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1	  	  	  	· · · · · · · · · · · ·	· · · · · · · · · · · ·	C C C C C	.G. .G. .G. .G. .G.	· · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · ·	  		· · · · · · · · · · · ·	· · · · · · · · · · · ·	G G G G	· · · · · · · · · · · · · · · · · · ·	c c c c c	T T T T T	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	· · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	с с с с с	. G . . G . . G . . G . . G . . G .	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·	 A	· · · · · · · · · · · · · · · · · · ·	· · · · · · · · · · · · · · · · · · ·		· · · · · · · · · · · · · · · · · · ·	c c c c	T T T T T T	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	···· ···· ···· 9999	···· ···· ···· 9999	···· ···· ···· 9999	···· ···· ···· 9999	···· ···· ···· 9999	C C C C C 999	.G. .G. .G. .G. .G. .G. .G. 999	   9999	   9999	   9999	   9999	···· ··· ··· 9999	 A  9999	   9999	   9999	G G G G G G G	   9999	c c c c c c c	T T T T T T T	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	   999 333	   999 444	   999 444	   999 444	   999 455	C C C C C 999 555	.G. .G. .G. .G. .G. .G. .G. 999	   999 556	   999 666	   999 666	   999 666	   9999 777	 A  9999 777	   9999 777	   9999 788	G G G G G G 999 888	   999 888	C C C C C C 999 889	T T T T T 999 999	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONGBO_OR7D1-1 BONGBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1	  999 333 789	···· ···· ···· 9999	   999 444 345	   9999 444 678	   999 455	C C C C C 999 555	.G. .G. .G. .G. .G. .G. .G. 999	   999 556	   999 666	   999 666	   999 666	   9999 777	 A  9999 777	   9999 777	   9999 788	G G G G G G 999 888	   999 888	C C C C C C 999 889	T T T T T 999 999	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2	  999 333 789	···· ··· ··· 999 444 012	   999 444 345	   9999 444 678	   999 455	C C C C C 999 555	.G. .G. .G. .G. .G. .G. .G. 999	999 556 890	999 666 123	   999 666	999 666 789	9999 7777 012	 A  9999 777 345 	999 777 678	999 901	G G G G G G 999 888	999 888 567	C C C C C C 999 889	T T T T T 999 999	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTDL-1 GORILLA_ORTDL-2 BONOBO_ORTD1-1 BONOBO_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1	  999 333 789	999 444 012	999 444 345 	999 444 678	999 455 901	C C C C C 999 555 234 	.G. .G. .G. .G. .G. .G. 9999 555 567 	999 556 890 	999 666 123 	999 666 456 	999 666 789 	999 777 012 	9999 7777 345 	999 777 678 	999 788 901	G G G G G 999 888 234 	999 888 567 	C C C C C C C C C C	T T T T T 999 999	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2	  999 333 789	9999 444 012	999 444 345 	9999 444 678 	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. 9999 5555 567  	999 556 890 	999 666 123  	999 666 456 	999 666 789 	999 777 012  	999 777 345 	9999 7777 678 	9999 788 901  	G G G G G 999 888 234  	999 888 567 	C C C C C C 9999 8899 890  	T T T T T 999 999 123  	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONGBO_OR7D1-1 BONGBO_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1	9999 333 789 TGA	9999 444 012	999 444 345  	9999 444 678  	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. 9999 5555 567  	999 556 890  	999 666 123  	999 666 456 	999 666 789  	9999 7777 012  	999 777 345 	9999 7777 678  	9999 788 901  	G G G G G 999 888 234  	999 888 567  	C C C C 9999 8899 890  	T T T T 999 123  	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONGBO_OR7D1-1 BONGBO_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBŪS_OR7D4 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-2	9999 333 789 TGA	999 444 012  	999 444 345 	999 444 678  	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. .G. 555 567  	999 556 890  	999 666 123  	999 666 456  	999 666 789  	9999 7777 012  	999 777 345  	999 777 678  	9999 788 901  	G G G G G 999 888 234  	9999 888 567  	C C C C 9999 8899 890  	T T T T 9999 123   	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-1 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 RHESUS_ORTD4-1 RHESUS_ORTD4-2 ORANGUTAM_ORTD4-1	9999 333 789 TGA	999 444 012  	999 444 345 	999 444 678  	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. .G. 555 567  	999 556 890  	999 666 123  	999 666 456  	999 666 789  	9999 7777 012  	999 777 345  	999 777 678  	9999 788 901  	G G G G G 999 888 234  	9999 888 567  	C C C C 9999 8899 890  	T T T T 9999 123   	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONGBO_OR7D1-1 BONGBO_OR7D1-1 BONGBO_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 HUMAN_OR7D1 LEMUR_OR7D4/OR7D1 COLOBUS_OR7D4 PIGTAIL_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-1 ORANGUTAN_OR7D4-2	9999 333 789 TGA	999 444 012  	999 444 345 	999 444 678  	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. .G. 555 567  	999 556 890  	999 666 123  	999 666 456  	999 666 789  	9999 7777 012  	9999 777 345  	999 777 678  	9999 788 901  	G G G G G 999 888 234  	9999 888 567  	C C C C 9999 8899 890  	T T T T 9999 123   	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONGBO_OR7D1-1 BONGBO_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 UDABUS_OR7D4 PIGTAIL_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-2 GORILLA_OR7D4	9999 333 789 TGA	999 444 012  	999 444 345 	999 444 678  	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. .G. 555 567  	999 556 890  	999 666 123  	999 666 456  	999 666 789  	9999 7777 012  	9999 777 345  	999 777 678  	9999 788 901  	G G G G G 999 888 234  	9999 888 567  	C C C C 9999 8899 890  	T T T T 9999 123   	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 RHESUS_ORTD4-1 ORANGUTAN_ORTD4-1 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4	9999 333 789 TGA	999 444 012  	999 444 345 	999 444 678  	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. .G. 555 567  	999 556 890  	999 666 123  	999 666 456  	999 666 789  	9999 7777 012  	9999 777 345  	999 777 678  	9999 788 901  	G G G G G 999 888 234  	9999 888 567  	C C C C 9999 8899 890  	T T T T 9999 123   	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONGBO_OR7D1-1 BONGBO_OR7D1-1 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 UNAN_OR7D1 UNAN_OR7D1 DIGTAIL_OR7D4-1 RIESUS_OR7D4-1 RIESUS_OR7D4-2 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-2 GORILLA_OR7D4-2 GORILLA_OR7D4 BONGBO_OR7D4 CHIMPANZEE_OR7D4	9999 3333 789 TGA	999 444 012  	999 444 345 	999 444 678  	999 455 901  	C C C C C S55 234  	.G. .G. .G. .G. .G. .G. 555 567  	999 556 890  	999 666 123  	999 666 456  	999 666 789  	9999 7777 012  	9999 777 345  	999 777 678  	9999 788 901  	G G G G G 999 888 234  	9999 888 567  	C C C C 9999 8899 890  	T T T T 9999 123  	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 RHESUS_ORTD4-1 ORANGUTAN_ORTD4-1 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4	999 333 789 TGA	999 444 012  	999 444 345     	999 444 678      	999 455 901      	C C C C C C C C	.G. .G. .G. .G. .G. .G. .G. .G. .G. .G.	9999 5566 890      	999 666 123       	999 666 456     	999 666 789     	 9999 7777 012       	A A  9999 7777 345      	 9999 7777 678       	 9999 788 901       	G G G G G 9999 8888 234       	 9999 8888 567       	C C C C C 9999 8890      	T T T T T T T T T T	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-4 BONOBO_ORTD4 CHIMPANZEE_ORTD4 CHIMPANZEE_ORTD4	999 333 789 TGA	9999 444 012     TGG TGG	9999 444 345      GGC GGC	9999 444 678       ACA ACA	9999 455 901       	C C C C C C C C	.G. .G. .G. .G. .G. .G. .G. .G. .G. .G.	9999 5566 890      CTG CTA	999 9666 123       AGA	9999 666 456      GGA GGA	999 666 789     TGC TGC	 9999 777 012       	A A  9999 7777 345       	9999 777 678       -	 9999 788 901      CTT CTT	G G G G 9999 888 234       	999 988 567       CAA	C C C C C 9999 8890 8890 8890    	T T T T T 9999 9299 123         	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 LEMUR_ORTD4/ORTD1 COLOBUS_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 BONOBO_ORTD4 CHIMPANZEE_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD1 RHESUS_ORTD1-1	9999 333 789 TGA        	9999 444 012      T T T T T T T T	9999 444 345      GGC GGC GGC	9999 444 678       	9999 455 901       	C C C C C C C C	.G. .G. .G. .G. .G. .G. .G. .G. .G. .G.	9999 5566 890       	999 9666 123       	9999 666 456      GGA GGA	9999 6666 7899       	9999 777 012       	A A  9999 7777 345       	9999 7777 678      	9999 788 901       	G G G G G 9999 888 234       	9999 888 567       	C C C C C 9999 8890 8890 8890    	T T T T T 9999 923 123         	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 ULEMUR_ORTD4/ORTD1 COLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 ORANGUTAN_ORTD4-1 GORILLA_ORTD4-1 GORILLA_ORTD4-2 GORILLA_ORTD4-2 GORILLA_ORTD4-1 BONOBO_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD1 RHESUS_ORTD1 ORANGUTAN_ORTD1-2	9999 333 789 TGA        	9999 444 012     TGG TGG TGG	9999 444 345     GGC GGC GGC GGC	9999 444 678       ACA ACA A	9999 455 901       	C C C C C C C C	.G. .G. .G. .G. .G. .G. .G. .G. .G. .G.	9999 5566 8900      CTG CTA CTA	999 666 123      AGA AGA	9999 666 456      GGA GGA GGA	9999 666 789     TGC TGC TGC	 9999 777 012      TAT TAT TAT TA	A A 9999 777 345       AGG TGG	999 9777 678       	 9999 788 901      CTT CTT CTT CT	G G G G 9999 888 234       	9999 9888 567      CAA CAA CAA	C C C C C 9999 8890      	T T T T T 9999 123      TGA TGA	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONGBO_OR7D1-1 BONGBO_OR7D1-1 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 UNAN_OR7D1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4 BONGBO_OR7D4 CHIMPANZEE_OR7D4 BONGBO_OR7D4 CHIMPANZEE_OR7D4 BONGBO_OR7D4 CHIMPANZEE_OR7D1 RHESUS_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-1	9999 3333 789 TGA         	999 444 012     TGG TGG TGG TGG TGG	999 444 345     GGC GGC GGC GGC GGC	999 444 678     ACA ACA ACA ACA	999 455 901      ACC ACC ACC AC	C C C C C C C C	.G. .G. .G. .G. .G. .G. .G. .G. .G. .G.	999 556 890     CTG CTA CTA CTA	999 666 123      AGA AGA AGA	9999 6666 456      GGA GGA G	9999 6666 789      TGC TGC TGC TGC TGC	999 777 012      TAT TAT TAT TA	A A 9999 7777 345       AdG AdG TGG TGG GGG	999 777 678       TCC TCC T	9999 788 901      CTT CTT CTT CT	G G G G G G G 9999 8888 234       	9999 888 567      CAA CAA CAA	C C C C C C 9999 8890      	T T T T T 9999 9999 123        TGA TGA TGA	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD1 PIGTAIL_ORTD1 PIGTAIL_ORTD1 PIGTAIL_ORTD1-1 ORANGUTAN_ORTD1-1 ORANGUTAN_ORTD1-1 ORANGUTAN_ORTD1-2 GORILLA_ORTD1-2	9999 333 789 TGA       	999 444 012     TGG TGG TGG TGG CGG CGG	9999 444 345     GGC GGC GGC GAC GAC	999 444 678     ACA ACA ACA ACA ACA	9999 455 901      ACC ACC AC	C C C C C C C C	.G. .G. .G. .G. .G. .G. .G. .G. .G. .G.	9999 5566 890     CTG CTA CTA CTA CTA	9999 6666 123     AGA AGA AGA AGA	9999 6666 456     GGA GGA GGA GGA	999 666 789     TGC TGC TGC TGC TGC	9999 777 012     TAT TAT TAT TAT TAT	9999 7777 345      AGG AGG TGG GGG GGG	9999 7777 678      TCC TCC TCC T	9999 788 901     CTT CTT CTT CTT CTT	G G G G G 9999 888 234     AAG AAG AAG AAG	9999 888 567     CAA CAA CAA CAA	C C C C C 9999 8890      	T T T T 9999 123  T 9999 123         	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-2 HUMAN_ORTD1 UCLOBUS_ORTD4 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 PIGTAIL_ORTD4-1 ORANGUTAN_ORTD4-1 ORANGUTAN_ORTD4-1 GORILLA_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD4 HUMAN_ORTD4 PIGTAIL_ORTD1 RHESUS_ORTD1 ORANGUTAN_ORTD1-1 GORILLA_ORTD1-2 GORILLA_ORTD1-2 BONOBO_ORTD1-1	9999 333 789 TGA         	9999 444 012     TGG TGG TGG TGG CGG CGG CGG	9999 444 345      GGC GGC GGC GG	9999 444 678       	9999 455 901       	C C C C C C C C	. G. . G. . G. . G. . G. . G. . G. . G.	9999 5556 8900       CTG CTA CTA CTA CTA CTA	999 666 123       	9999 6666 4556      GGA GGA G	9999 6666 789       	 9999 7777 0122       	9999 7777 345       	9999 7777 678      	9999 788 901       	G G G G 9999 8888 234       	9999 8888 5677       	C C C C C 9999 8890      	T T T T 9999 123  T 9999 123         	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 UNAN_OR7D1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 BONOBO_OR7D4 DIGTAIL_OR7D1 RHESUS_OR7D4 DIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-2 GORILLA_OR7D1-2 BONOBO_OR7D1-2 BONOBO_OR7D1-2	9999 3333 789 TGA       	9999 444 012     TGG TGG TGG CGG CGG CGG CGG CGG CGG CGG	9999 444 345      GGC GGC GGC GG	9999 444 678       	9999 455 901       	C C C C C C C C	. G. . G. . G. . G. . G. . G. . G. . G.	9999 5556 8900      CTG CTA CTA CTA CTA CTA	999 6666 123       	9999 6666 456      GGA GGA G	9999 6666 789       	 999 777 012       TAT TAT T	999 777 345       	999777 678  678     	9999 788 901       	G G G G G 9999 8888 234       	9999 8888 5677       	C C C C C 9999 8890      	T T T T 9999 123       T T-	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_ORTD1-1 GORILLA_ORTD1-2 BONOBO_ORTD1-1 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 CHIMPANZEE_ORTD1-1 PIGTAIL_ORTD4-2 RIESUS_ORTD4-1 PIGTAIL_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 ORANGUTAN_ORTD4-2 GORILLA_ORTD4 PIGTAIL_ORTD4-2 BONOBO_ORTD1 PIGTAIL_ORTD1 PIGTAIL_ORTD1-1 ORANGUTAN_ORTD1-1 ORANGUTAN_ORTD1-1 ORANGUTAN_ORTD1-1 BONOBO_ORTD1-2 BONOBO_ORTD1-2 BONOBO_ORTD1-2 CHIMPANZEE_ORTD1-2	9999 3333 7899 TGA         	9999 444 012       TGG TGG T	9999 444 345      GGC GGC GGC	9999 444 678       ACA ACA A	9999 4555 901      ACC ACC A	C C C C C C C C	.G. .G. .G. .G. .G. .G. .G. .G. .G. .G.	9999 5566 8900     CTG CTA CTA CTA CTA CTA CTA CTA CTA	9999 6666 123      AGA AGA A	9999 6666 456     GGA GGA GGA GGA	9999 6666 7899     T	 9999 7777 012       		9999 7777 678      	 9999 788 901       	G G G G G 9999 8888 234       	 9999 8888 567      CAA CAA CAA CA	C C C C C 9999 8899 8890 8890 8890 8900  	T T T T T 9999 9999 1233     TGA TGA TGA TGA TGA TGA TGA TGA	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c
GORILLA_OR7D1-1 GORILLA_OR7D1-2 BONOBO_OR7D1-1 BONOBO_OR7D1-1 BONOBO_OR7D1-2 CHIMPANZEE_OR7D1-2 CHIMPANZEE_OR7D1-1 CHIMPANZEE_OR7D1-2 HUMAN_OR7D1 UNAN_OR7D1 PIGTAIL_OR7D4-1 PIGTAIL_OR7D4-1 RHESUS_OR7D4-1 RHESUS_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 ORANGUTAN_OR7D4-1 BONOBO_OR7D4 DIGTAIL_OR7D1 RHESUS_OR7D4 DIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 ORANGUTAN_OR7D1-2 GORILLA_OR7D1-2 BONOBO_OR7D1-2 BONOBO_OR7D1-2	9999 3333 7899 TGA       	9999 444 012       TGG TGG T	9999 444 345     GGC GGC GGC GAC GAC GAC GAC GAC	9999 444 678       	9999 455 901       	C C C C C C C C	. G. . G. . G. . G. . G. . G. . G. . G.	9999 5566 890      CTG CTA CTA CTA CTA CTA CTA CTA CTA CTA	9999 6666 123       	9999 6666 456      	9999 6666 7899       TGC TGC TGC TGC TGC TGC TGC TGC TGC TGC	9999 7777 012       		9999 7777 678      	9999 788 901       	G G G G G 999 888 234       	9999 888 567       	C C C C C C C 	T T T T T 9999 9999 1233       	· · · · · · · · · · · ·	. GG . GG . GG . GG . GG . GG	G G G G G G	· · · · · · · · · · · ·		T T T T T	c c c c c

Fig. S2. Continued.

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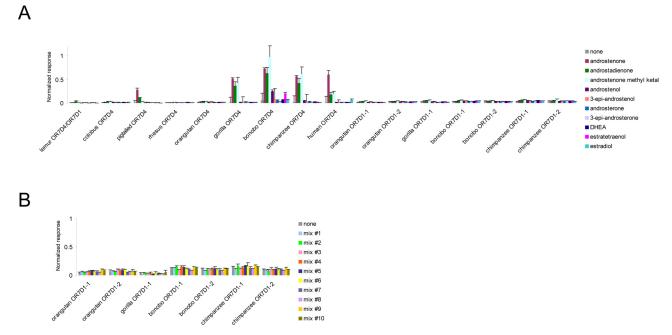
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PIGTAIL OR7D4-1		GA						
RHESUS OR7D4-2		GA						
GREAT_APE_OR7D4		KD.						
ORANGUTAN OR7D4-1		KD. KD.						
HOMININE_OR7D4 GORILLA OR7D4		KF.D.						
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LEMUR_OR7D4/OR7D1	LLTLRLTFSL	1234567890 ETEIPHFFCD	1234567890 LAQILEVACS	1234567890 DTLINNICMY	1234567890 LLTVLLGVFP	1234567890 VTGILFSYSK	1234567890 IVSSLMSMSS	1234567890 TAGKNKAFST
CATARRHINE_OR7D4	LLTLRLTFSL	1234567890 ETEIPHFFCD GE	1234567890 LAQILEVACS V.KR.	1234567890 DTLINNICMY LVL.	1234567890 LLTVLLGVFP VA.A	1234567890 VTGILFSYSK .AQ	1234567890 IVSSLMSMSS R	1234567890 TAGKNKAFST .EY
	LLTLRLTFSL MKT MKAT	1234567890 ETEIPHFFCD	1234567890 LAQILEVACS V.KR. V.KR.	1234567890 DTLINNICMY LVL. LVL.	1234567890 LLTVLLGVFP VA.A VA.A	1234567890 VTGILFSYSK .AQ .AQ	1234567890 IVSSLMSMSS R R	1234567890 TAGKNKAFST .EY .EY
CATARRHINE_OR7D4 OWM_OR7D4 COLOBUS_OR7D4 MACACA_OR7D4	LLTLRLTFSL MKT MKAT MKAI MKAT	1234567890 ETEIPHFFCD GE GE GE GE	1234567890 LAQILEVACS V.KR. V.KR. V.KR. VV.KR.	1234567890 DTLINNICMY LVL. LVL. NLVL.	1234567890 LLTVLLGVFP VA.A VA.A VA.A VA.A	1234567890 VTGILFSYSK .AQ .AQ AAQ .AQ	1234567890 IVSSLMSMSS R .IR .R	1234567890 TAGKNKAFST .EY .EY .EYE .EY
CATARRHINE_OR7D4 OWM_OR7D4 COLOBUS_OR7D4 MACACA_OR7D4 PIGTAIL_OR7D4-1	LLTLRLTFSL MKAT MKAT MKAT MKAT MKAT	1234567890 ETEIPHFFCD GE GE GE GE GE	1234567890 LAQILEVACS V.KR. V.KR. V.V.KR. V.V.KR. V.V.KR.	1234567890 DTLINNICMY LVL. LVL. N.LVL. N.LVL.	1234567890 LLTVLLGVFP VA.A VA.A VA.A VA.A VA.A	1234567890 VTGILFSYSK .AQ .AQ AAQ AAQ .AI.FQ .AI.FQ	1234567890 IVSSLMSMSSS R .IR .IR R	1234567890 TAGKNKAFST .E.Y .E.Y .E.YE .E.Y .E.Y
CATARRHINE_OR7D4 OWM_OR7D4 COLOBUS_OR7D4 MACACA_OR7D4 PIGTAIL_OR7D4-1 RHESUS_OR7D4-2	LLTLRLTFSL MKT MKAT MKAI MKAT MKAT	1234567890 ETEIPHFFCD GE GE GE GE GE GE	1234567890 LAQILEVACS V.K.R. V.K.R. V.V.K.R. V.V.K.R. V.V.K.R. V.V.K.R.	1234567890 DTLINNICMY LVL. LVL. N.LVL. N.LVL. N.LVL. NVL.	1234567890 LLTVLLGVFP VA.A VA.A VA.A VA.A VA.A VA.A	1234567890 VTGILFSYSK .AQ .AQ AAQ .AI.FQ .AI.FQ .AI.FQ	1234567890 IVSSLMSMSS R .IR .IR R R	1234567890 TAGKNKAFST .E.Y .E.Y .E.YE .E.Y .E.Y .E.Y
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Fig. S2. Continued.

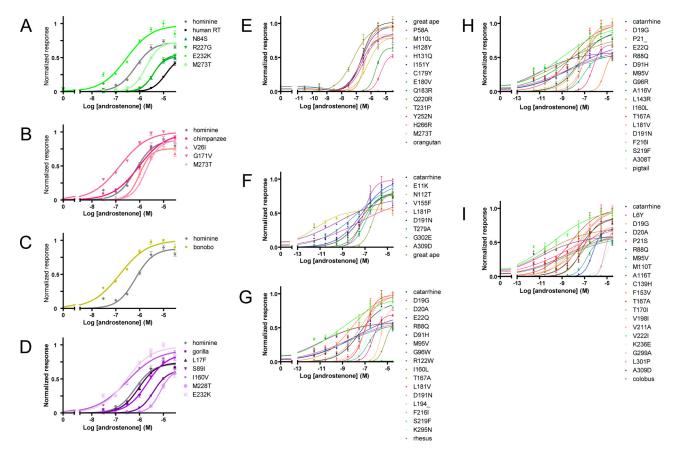
PNAS PNAS

LEMUR OR7D4/OR7D1 PIGTAIL OR7D1 RHESUS_OR7D1 ORANGUTAN OR7D1-1 GORILLA_OR7D1-1 BONOBO_OR7D1-1 CHIMPANZEE_OR7D1-1 HUMAN_OR7D1	1234567890 MEAENYTDIS .KH.EL. .KH.EL. L.EL. L.EL. L.EL.	1111111112 1234567890 EFLLLGLSED FD. D. D. D. D. D.	1234567890 PALQPLIYGL .EVLF .EVLF .EVLF .EVLF .EVLF	1234567890 FLFMYLVTMF SVVL SVVL SVL SVL SVL	1234567890 GNLLIILAVS .K RI. I.	1234567890 SDSHLHTPMY	1234567890 FFLSNLSFVD	1234567890 ICFTSTTIPK ?IV.R ?IV.R T.IV. TIV. TIV. TIV. TIV.
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LEMUR_OR7D4/OR7D1 PIGTAIL_OR7D1 RHESUS_OR7D1 ORANGUTAN_OR7D1-1 GORILLA_OR7D1-1 BONOBO_OR7D1-1 CHIMPANZEE_OR7D1-1 HUMAN_OR7D1	6666666667 1234567890 LLTLRLTFSL .MKSI .MKST .MKT .MKT .MKT	111111111 777777778 1234567890 ETEIPHFFCD G.KE GE GE GE GE GE GE GE	8888888889 1234567890 LAQILEVACS V.KM.H. V.KM.H. V.K. R. V.K. R. V.K. H. V.K. R.	99999999990 1234567890 DTLINNICMY LVVL. LVL. LIVL. LIVL.	000000001 1234567890 LLTVLLGVFP VA.A VA.A VA.A VA.A VA.A	111111112 1234567890 VTGILFSYSK .AIFQ .AQ .AQ .AQ .AQ	222222223 1234567890 IVSSLMSMSS R R R R R R R 	333333333 1234567890 TAGKNKAFST .E.Y .E.Y .E.Y .K.Y .E.Y
LEMUR OR7D4/OR7D1 PIGTATL OR7D1 RHESUS_OR7D1 ORANGUTAN OR7D1-1 GORILLA_OR7D1-1 BONOBO_OR7D1-1 CHIMPANZEE OR7D1-1 HUMAN_OR7D1	444444445 1234567890 CGSHLCVVCL S. S. S. SF SF S	222222222 555555556 1234567890 FYGGVGVYL L .NL .CL .CL	6666666667 1234567890 SSAVTPSSQS H H H H	77777778 1234567890 SNIASVMYTV .SMM .SMAM .SMAM .SMAM .STAM	8888888889 1234567890 VTPMLNPFIY	99999999990 1234567890 SLKNKDVKGA .R .RV .RV .RV .R .R	000000001 1234567890 LGRLLSTTAS RA RA RA RA RA RA	111111112 1234567890 CL* *.LWGTTSEL .LWGTTSEL .LRGTTSEL .LRDTTSEL .LRDTTSEL .LRDTTSEL
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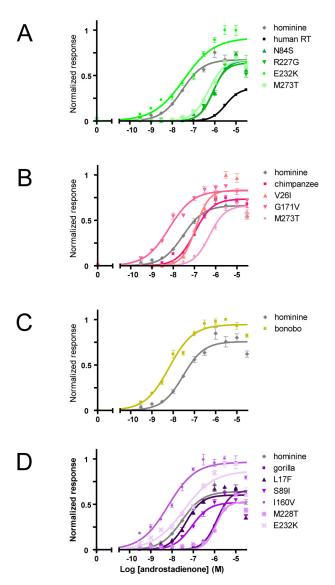
#### Fig. S2. Continued.



**Fig. S3.** Primate OR7D1 orthologs do not have a cognate ligand among the odorants tested. (A) Screen of primate OR7D4/OR7D1 orthologs against 10 steroids. One allele of OR7D4 ortholog per species and all intact alleles of OR7D1 are shown. (B) Screen of primate OR7D1 orthologs against 10 mixtures of odorants. All intact alleles of OR7D1 orthologs are shown. See Table S1 for a list of odorants in each mixture. In (A and B), y axis denotes normalized response  $\pm$  SEM. (n = 2). In (B), y axis is normalized to a positive control.

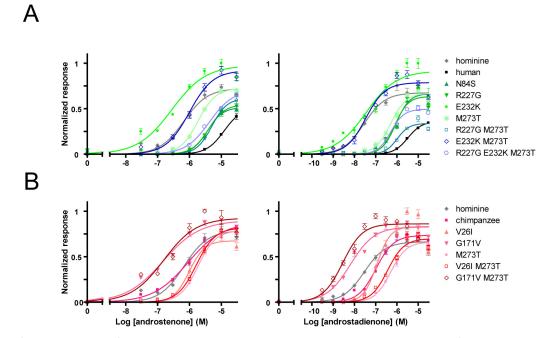


**Fig. 54.** Point mutations are responsible for the functional divergence of OR7D4 orthologs in response to androstenone. Dose-response curves of the hypothetical ancestor OR7D4 and their respective more derived species/ancestors are shown along with the corresponding synthetic mutants in response to androstenone: (*A*) hominine ancestor and human, (*B*) hominine ancestor and chimpanzee, (*C*) hominine ancestor and bonobo, (*D*) hominine ancestor and gorilla, (*E*) Great Ape ancestor and orangutan, (*F*) catarrhine ancestor and Great Ape ancestor, (*G*) catarrhine ancestor and rhesus macaque, (*H*) catarrhine ancestor and pigtailed macaque, and (*I*) catarrhine ancestor and colobus monkey. *y* axis denotes normalized response  $\pm$  SEM. (n = 3-4).

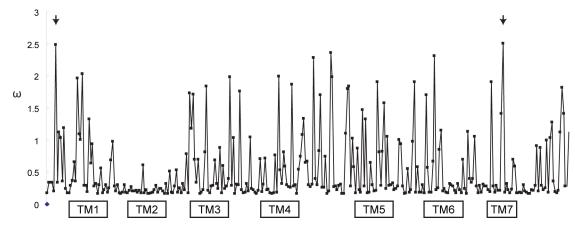


**Fig. S5.** Selected synthetic mutations are responsible for the functional divergence of OR7D4 orthologs in response to androstadienone. Dose-response curves of the hypothetical hominine ancestor OR7D4 shown with OR7D4 orthologs of (*A*) human, (*B*) chimpanzee, (*C*) bonobo, and (*D*) gorilla and their corresponding synthetic mutants in response to androstadienone. *y* axis denotes normalized response  $\pm$  SEM. (*n* = 4).

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**Fig. S6.** Variable functional activation of selected hominine double and triple synthetic mutants. Dose-response curves of additional double and triple mutants for simulations of intermediate states between the hypothetical hominine ancestor and (A) human and (B) chimpanzee to androstenone (*Left*) and androstadienone (*Right*) are shown with all synthetic mutants in these species. y axis denotes normalized response  $\pm$  SEM. (n = 4).



**Fig. 57.** Variation in  $\omega$  in the OR7D4 gene. The  $\omega$  value for each codon is calculated by the M8 positive selection model of PAML using the OR7D4 only dataset shown in Table S5. The approximate limits of predicted transmembrane domains of OR7D4 are represented in boxes. Arrows indicate codons with a posterior probability of positive selection >0.95 using the Bayes empirical Bayes calculation.

## **Other Supporting Information Files**

Table 1 (PDF) Table 2 (PDF) Table 3 (PDF) Table 4 (PDF) Table 5 (PDF)