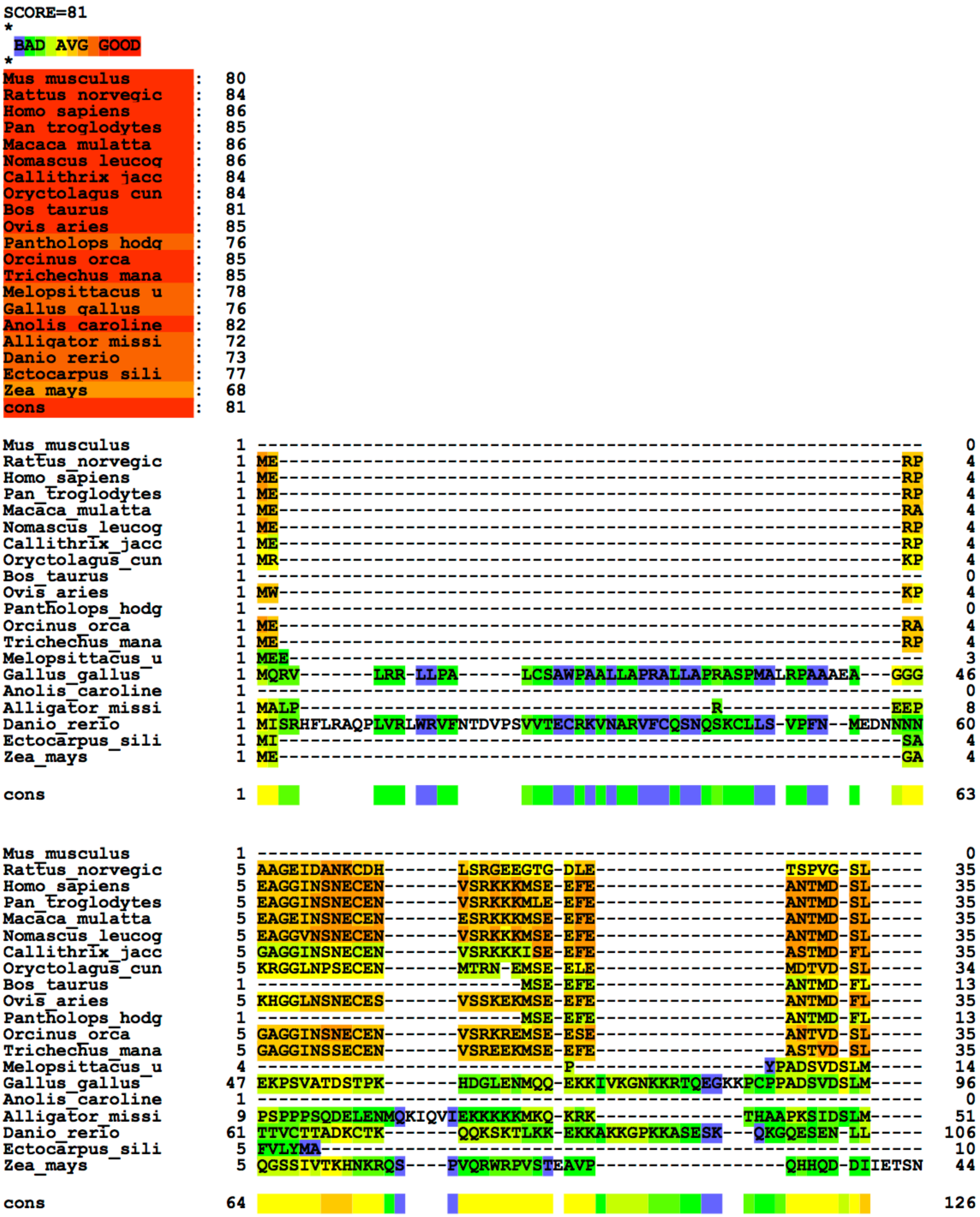
Figure S2.



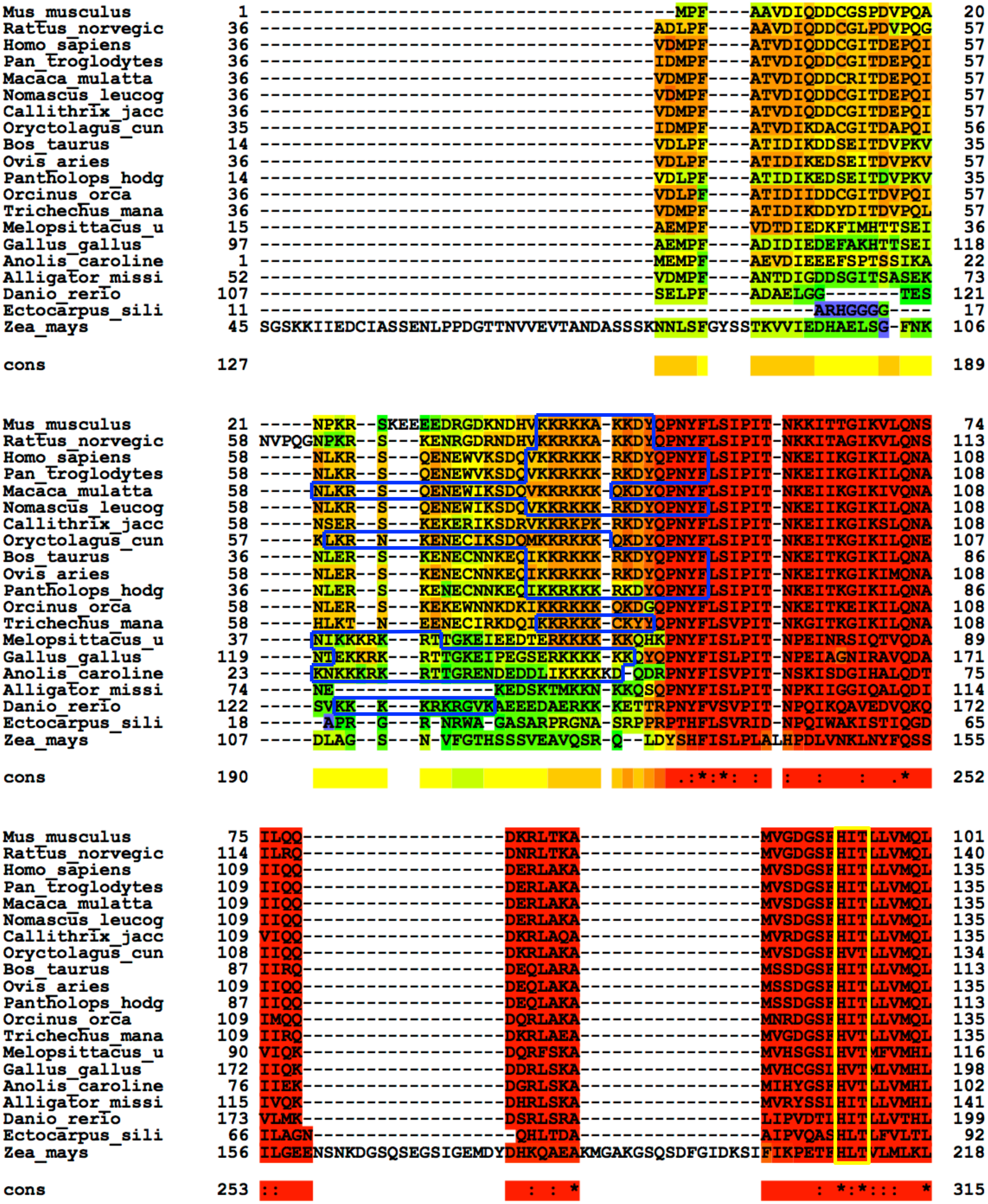
```
SCORE=81
*
 BAD AVG GOOD
*
Mus musculus      :  80
Rattus norvegic   :  84
Homo sapiens      :  86
Pan troglodytes   :  85
Macaca mulatta    :  86
Nomascus leucog   :  86
Callithrix jacc   :  84
Oryctolagus cun   :  84
Bos taurus        :  81
Ovis aries        :  85
Pantholops hodg   :  76
Orcinus orca      :  85
Trichechus mana   :  85
Melopsittacus u   :  78
Gallus gallus     :  76
Anolis caroline   :  82
Alligator missi   :  72
Danio rerio       :  73
Ectocarpus sili   :  77
Zea mays          :  68
cons              :  81

Mus_musculus         1 ---------------------------------------------------------------    0
Rattus_norvegic      1 ME-----------------------------------------------------------RP    4
Homo_sapiens         1 ME-----------------------------------------------------------RP    4
Pan_troglodytes      1 ME-----------------------------------------------------------RP    4
Macaca_mulatta       1 ME-----------------------------------------------------------RA    4
Nomascus_leucog      1 ME-----------------------------------------------------------RP    4
Callithrix_jacc      1 ME-----------------------------------------------------------RP    4
Oryctolagus_cun      1 MR-----------------------------------------------------------KP    4
Bos_taurus           1 ---------------------------------------------------------------    0
Ovis_aries           1 MW-----------------------------------------------------------KP    4
Pantholops_hodg      1 ---------------------------------------------------------------    0
Orcinus_orca         1 ME-----------------------------------------------------------RA    4
Trichechus_mana      1 ME-----------------------------------------------------------RP    4
Melopsittacus_u      1 MEE------------------------------------------------------------    3
Gallus_gallus        1 MQRV-------LRR-LLPA------LCSAWPAALLAPRALLAPRASPMALRPAAAEA---GGG   46
Anolis_caroline      1 ---------------------------------------------------------------    0
Alligator_missi      1 MALP---------------------------------------R----------------EEP    8
Danio_rerio          1 MISRHFLRAQPLVRLWRVFNTDVPSVVTECRKVNARVFCQSNQSKCLLS-VPFN--MEDNNNN   60
Ectocarpus_sili      1 MI-----------------------------------------------------------SA    4
Zea_mays             1 ME-----------------------------------------------------------GA    4

cons                 1                                                                   63

Mus_musculus         1 ---------------------------------------------------------------    0
Rattus_norvegic      5 AAGEIDANKCDH-------LSRGEEGTG-DLE------------------TSPVG-SL-----   35
Homo_sapiens         5 EAGGINSNECEN-------VSRKKKMSE-EFE------------------ANTMD-SL-----   35
Pan_troglodytes      5 EAGGINSNECEN-------VSRKKKMLE-EFE------------------ANTMD-SL-----   35
Macaca_mulatta       5 EAGEINSNECEN-------ESRKKKMSE-EFE------------------ANTMD-SL-----   35
Nomascus_leucog      5 EAGGVNSNECEN-------VSRKKKMSE-EFE------------------ANTMD-SL-----   35
Callithrix_jacc      5 GAGGINSNECEN-------VSRKKKISE-EFE------------------ASTMD-FL-----   35
Oryctolagus_cun      5 KRGGLNPSECEN-------MTRN-EMSE-ELE------------------MDTVD-SL-----   34
Bos_taurus           1 -------------------------MSE-EFE------------------ANTMD-FL-----   13
Ovis_aries           5 KHGGLNSNECES-------VSSKEKMSE-EFE------------------ANTMD-FL-----   35
Pantholops_hodg      1 -------------------------MSE-EFE------------------ANTMD-FL-----   13
Orcinus_orca         5 GAGGINSNECEN-------VSRKREMSE-ESE------------------ANTVD-SL-----   35
Trichechus_mana      5 GAGGINSSECEN-------VSREEKMSE-EFE------------------ASTVD-SL-----   35
Melopsittacus_u      4 -----------------------------P------------------YPADSVDSLM-----   14
Gallus_gallus       47 EKPSVATDSTPK-------HDGLENMQQ-EKKIVKGNKKRTQEGKKPCPPADSVDSLM-----   96
Anolis_caroline      1 ---------------------------------------------------------------    0
Alligator_missi      9 PSPPPSQDELENMQKIQVIEKKKKKMKQ-KRK--------------THAAPKSIDSLM-----   51
Danio_rerio         61 TTVCTTADKCTK-------QQKSKTLKK-EKKAKKGPKKASESK---QKGQESEN-LL-----  106
Ectocarpus_sili      5 FVLYMA---------------------------------------------------------   10
Zea_mays             5 QGSSIVTKHNKRQS----PVQRWRPVSTEAVP------------------QHHQD-DIIETSN   44

cons                64                                                                  126
```



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Mus_musculus       1 ---------------------------------------MPF----AAVDIQDDCGSPDVPQA   20
Rattus_norvegic   36 -------------------------------------ADLPF----AAVDIQDDCGLPDVPQG   57
Homo_sapiens      36 -------------------------------------VDMPF----ATVDIQDDCGITDEPQI   57
Pan_troglodytes   36 -------------------------------------IDMPF----ATVDIQDDCGITDEPQI   57
Macaca_mulatta    36 -------------------------------------VDMPF----ATVDIQDDCRITDEPQI   57
Nomascus_leucog   36 -------------------------------------VDMPF----ATVDIQDDCGITDEPQI   57
Callithrix_jacc   36 -------------------------------------VDMPF----ATVDIQDDCGITDEPQI   57
Oryctolagus_cun   35 -------------------------------------IDMPF----ATVDIKDACGITDAPQI   56
Bos_taurus        14 -------------------------------------VDLPF----ATIDIKDDSEITDVPKV   35
Ovis_aries        36 -------------------------------------VDLPF----ATIDIKEDSEITDVPKV   57
Pantholops_hodg   14 -------------------------------------VDLPF----ATIDIKEDSEITDVPKV   35
Orcinus_orca      36 -------------------------------------VDLPF----ATIDIIDDCGITDVPQI   57
Trichechus_mana   36 -------------------------------------VDMPF----ATIDIKDDYDITDVPQL   57
Melopsittacus_u   15 -------------------------------------AEMPF----VDTDIEDKFIMHTTSEI   36
Gallus_gallus     97 -------------------------------------AEMPF----ADIDIEDEFAKHTTSEI  118
Anolis_caroline    1 -------------------------------------MEMPF----AEVDIEEEFSPTSSIKA   22
Alligator_missi   52 -------------------------------------VDMPF----ANTDIGDDSGITSASEK   73
Danio_rerio      107 -------------------------------------SELPF----ADAELGG-------TES  121
Ectocarpus_sili   11 ----------------------------------------------------ARHGGGG----   17
Zea_mays          45 SGSKKIIEDCIASSENLPPDGTTNVVEVTANDASSSKNNLSFGYSSTKVVIEDHAELSG-FNK  106

cons             127                                                                 189

Mus_musculus      21 -----NPKR--SKEEEEDRGDKNDHVKKRKKA-KKDYQPNYFLSIPIT-NKKITTGIKVLQNS   74
Rattus_norvegic   58 NVPQGNPKR--S---KENRGDRNDHVKKRKKA-KKDYQPNYFLSIPIT-NKKITAGIKVLQNS  113
Homo_sapiens      58 -----NLKR--S---QENEWVKSDQVKKRKKK-RKDYQPNYFLSIPIT-NKEIIKGIKILQNA  108
Pan_troglodytes   58 -----NLKR--S---QENEWVKSDQVKKRKKK-RKDYQPNYFLSIPIT-NKEIIKGIKILQNA  108
Macaca_mulatta    58 -----NLKR--S---QENEWIKSDQVKKRKKK-QKDYQPNYFLSIPIT-NKEIIKGIKIVQNA  108
Nomascus_leucog   58 -----NLKR--S---QENEWIKSDQVKKRKKK-RKDYQPNYFLSIPIT-NKEIIKGIKILQNA  108
Callithrix_jacc   58 -----NSER--S---KEKERIKSDRVKKRKPK-RKDYQPNYFLSIPIT-NKEIIKGIKSLQNA  108
Oryctolagus_cun   57 -----KLKR--N---KENECIKSDQMKKRKKK-QKDYQPNYFLSIPIT-NKEITKGIKILQNE  107
Bos_taurus        36 -----NLER--S---KENECNNKEQIKKRKKK-RKDYQPNYFLSIPIT-NKEITKGIKILQNA   86
Ovis_aries        58 -----NLER--S---KENECNNKEQIKKRKKK-RKDYQPNYFLSIPIT-NKEITKGIKIMQNA  108
Pantholops_hodg   36 -----NLER--S---KENECNNKEQIKKRKKK-RKDYQPNYFLSIPIT-NKEITKGIKILQNA   86
Orcinus_orca      58 -----NLER--S---KEKEWNNKDKIKKRKKK-QKDGQPNYFLSIPIT-NKEITKEIKILQNA  108
Trichechus_mana   58 -----HLKT--N---EENECIRKDQIKKRKKK-CKYYQPNYFLSVPIT-NKGITKGIKILQNA  108
Melopsittacus_u   37 -----NIKKKRK---RTTGKEIEEDTERKKKK-KKQHKPNYFISLPIT-NPEINRSIQTVQDA   89
Gallus_gallus    119 -----NTEKKRK---RTTGKEIPEGSERKKKK-KKQYQPNYFISLPIT-NPEIAGNIRAVQDA  171
Anolis_caroline   23 -----KNKKKRK---RTTGRENDEDDLIKKKK D-QDRPNYFISVPIT-NSKISDGIHALQDT   75
Alligator_missi   74 -----NE---------------KEDSKTMKKN-KKQSQPNYFISLPIT-NPKIIGGIQALQDI  114
Danio_rerio      122 -----SVKK--K---KRKRGVKAEEEDAERKK-KETTRPNYFVSVPIT-NPQIKQAVEDVQKQ  172
Ectocarpus_sili   18 ------APR--G---R-NRWA-GASARPRGNA-SRPPRPTHFLSVRID-NPQIWAKISTIQGD   65
Zea_mays         107 -----DLAG--S---N-VFGTHSSSVEAVQSR-Q--LDYSHFISLPLALHPDLVNKLNYFQSS  155

cons             190                                        .:*:*: :  :  :   :  .*    252

Mus_musculus      75 ILQQ-------------------DKRLTKA-----------------MVGDGSFHITLLVMQL  101
Rattus_norvegic  114 ILRQ-------------------DNRLTKA-----------------MVGDGSFHITLLVMQL  140
Homo_sapiens     109 IIQQ-------------------DERLAKA-----------------MVSDGSFHITLLVMQL  135
Pan_troglodytes  109 IIQQ-------------------DERLAKA-----------------MVSDGSFHITLLVMQL  135
Macaca_mulatta   109 IIQQ-------------------DERLAKA-----------------MVSDGSFHITLLVMQL  135
Nomascus_leucog  109 IIQQ-------------------DERLAKA-----------------MVSDGSFHITLLVMQL  135
Callithrix_jacc  109 VIQQ-------------------DKRLAQA-----------------MVRDGSFHITLLVMQL  135
Oryctolagus_cun  108 IIQQ-------------------DKRLAKA-----------------MVSDGSFHVTLLVMQL  134
Bos_taurus        87 IIRQ-------------------DEQLARA-----------------MSSDGSFHITLLVMQL  113
Ovis_aries       109 IIQQ-------------------DEQLAKA-----------------MSSDGSFHITLLVMQL  135
Pantholops_hodg   87 IIQQ-------------------DEQLAKA-----------------MSSDGSFHITLLVMQL  113
Orcinus_orca     109 IMQQ-------------------DQRLAKA-----------------MNRDGSFHITLLVMQL  135
Trichechus_mana  109 IIRQ-------------------DKRLAEA-----------------MVGDGSFHVTLLVMQL  135
Melopsittacus_u   90 VIQK-------------------DQRFSKA-----------------MVHSGSIHVTMFVMHL  116
Gallus_gallus    172 IIQK-------------------DDRLSKA-----------------MVHCGSIHVTMLVMHL  198
Anolis_caroline   76 IIEK-------------------DGRLSKA-----------------MIHYGSFHVTLLVMHL  102
Alligator_missi  115 IVQK-------------------DHRLSKA-----------------MVRYSSIHITLLVMHL  141
Danio_rerio      173 VLMK-------------------DSRLSRA-----------------LIPVDTIHITLLVTHL  199
Ectocarpus_sili   66 ILAGN-------------------QHLTDA-----------------AIPVQASHLTLFVLTL   92
Zea_mays         156 ILGEENSNKDGSQSEGSIGEMDYDHKQAEAKMGAKGSQSDFGIDKSIFIKPETFHLTVLMLKL  218

cons             253 ::                       : : *                      : *:*:::  *  315
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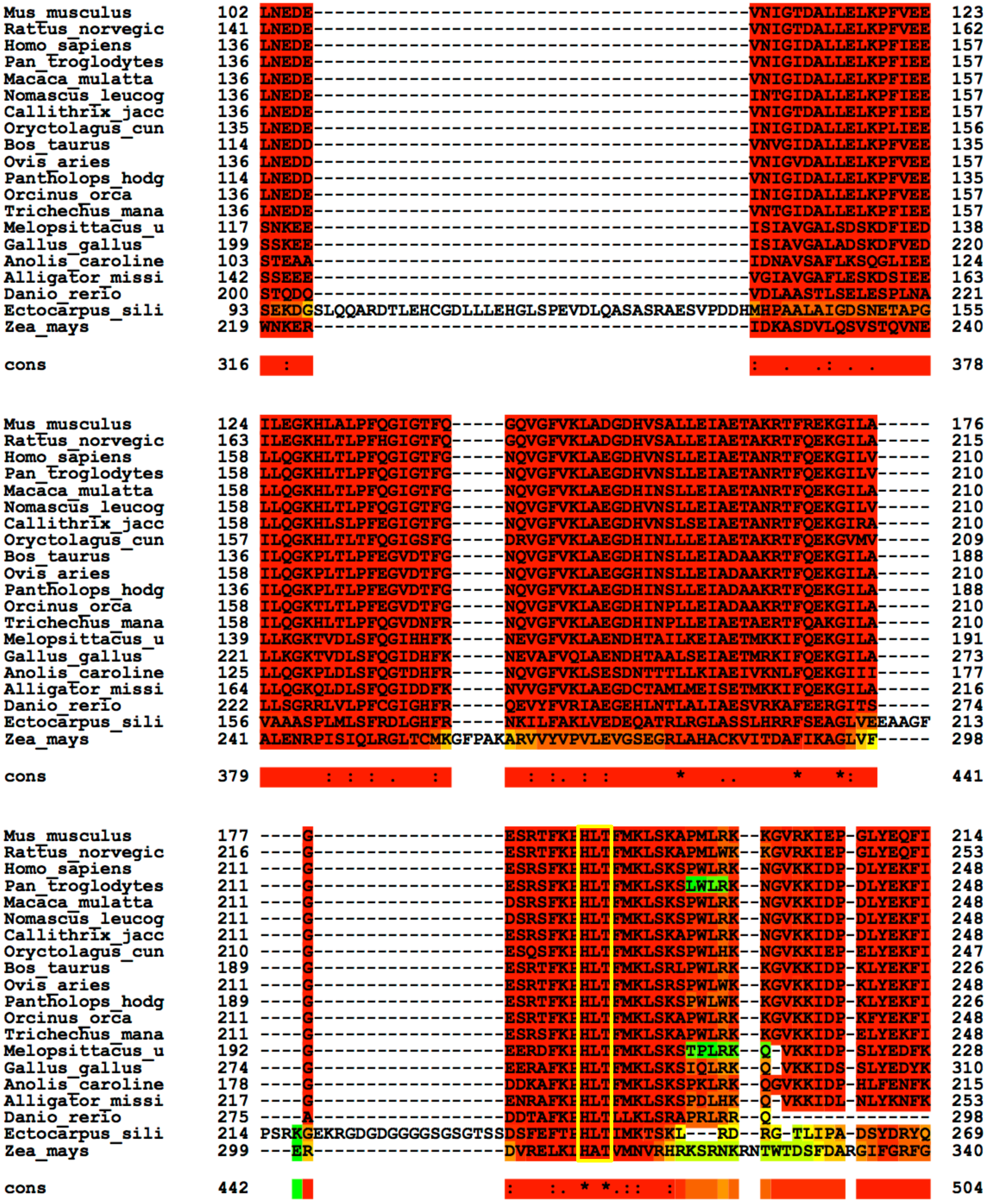
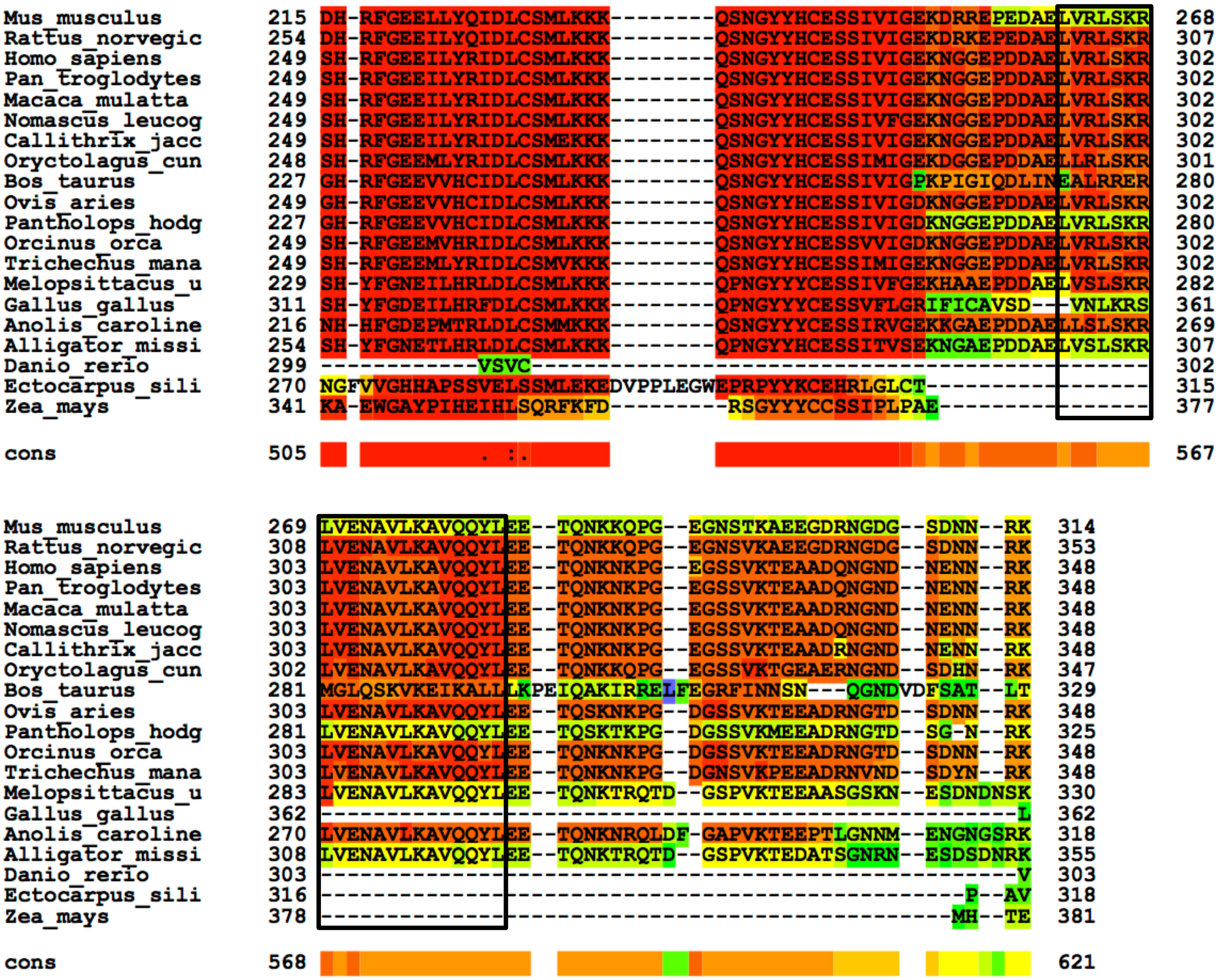


```
Mus_musculus         102 LNEDE----------------------------------------VNIGTDALLELKPFVEE 123
Rattus_norvegic      141 LNEDE----------------------------------------VNIGTDALLELKPFVEE 162
Homo_sapiens         136 LNEDE----------------------------------------VNIGIDALLELKPFIEE 157
Pan_troglodytes      136 LNEDE----------------------------------------VNIGIDALLELKPFIEE 157
Macaca_mulatta       136 LNEDE----------------------------------------VNIGIDALLELKPFIEE 157
Nomascus_leucog      136 LNEDE----------------------------------------INTGIDALLELKPFIEE 157
Callithrix_jacc      136 LNEDE----------------------------------------VNIGTDALLELKPFIEE 157
Oryctolagus_cun      135 LNEDE----------------------------------------INIGIDALLELKPLIEE 156
Bos_taurus           114 LNEDD----------------------------------------VNVGIDALLELKPFVEE 135
Ovis_aries           136 LNEDD----------------------------------------VNIGVDALLELKPFVEE 157
Pantholops_hodg      114 LNEDD----------------------------------------VNIGIDALLELKPFVEE 135
Orcinus_orca         136 LNEDE----------------------------------------INIGIDALLELKPFVEE 157
Trichechus_mana      136 LNEDE----------------------------------------VNTGIDALLELKPFIEE 157
Melopsittacus_u      117 SNKEE----------------------------------------ISIAVGALSDSKDFIED 138
Gallus_gallus        199 SSKEE----------------------------------------ISIAVGALADSKDFVED 220
Anolis_caroline      103 STEAA----------------------------------------IDNAVSAFLKSQGLIEE 124
Alligator_missi      142 SSEEE----------------------------------------VGIAVGAFLESKDSIEE 163
Danio_rerio          200 STQDQ----------------------------------------VDLAASTLSELESPLNA 221
Ectocarpus_sili       93 SEKDGSLQQARDTLEHCGDLLLEHGLSPEVDLQASASRAESVPDDHMHPAALAIGDSNETAPG 155
Zea_mays             219 WNKER----------------------------------------IDKASDVLQSVSTQVNE 240

cons                 316   :                                          :  .  .:  .  .      378

Mus_musculus         124 ILEGKHLALPFQGIGTFQ-----GQVGFVKLADGDHVSALLEIAETAKRTFREKGILA----- 176
Rattus_norvegic      163 ILEGKHLTLPFHGIGTFQ-----GQVGFVKLADGDHVSALLEIAETAKRTFQEKGILA----- 215
Homo_sapiens         158 LLQGKHLTLPFQGIGTFG-----NQVGFVKLAEGDHVNSLLEIAETANRTFQEKGILV----- 210
Pan_troglodytes      158 LLQGKHLTLPFQGIGTFG-----NQVGFVKLAEGDHVNSLLEIAETANRTFQEKGILV----- 210
Macaca_mulatta       158 LLQGKHLTLPFQGIGTFG-----NQVGFVKLAEGDHINSLLEIAETANRTFQEKGILA----- 210
Nomascus_leucog      158 LLQGKHLTLPFQGIGTFG-----NQVGFVKLAEGDHVNSLLEIAETANRTFQEKGILV----- 210
Callithrix_jacc      158 LLQGKHLSLPFEGIGTFG-----NQVGFVKLAEGDHVNSLSEIAETANRTFQEKGIRA----- 210
Oryctolagus_cun      157 ILQGKHLTLTFQGIGSFG-----DRVGFVKLAEGDHINLLLEIAETAKRTFQEKGVMV----- 209
Bos_taurus           136 ILQGKPLTLPFEGVDTFG-----NQVGFVKLAEGDHINSLLEIADAAKRTFQEKGILA----- 188
Ovis_aries           158 ILQGKPLTLPFEGVDTFG-----NQVGFVKLAEGGHINSLLEIADAAKRTFQEKGILA----- 210
Pantholops_hodg      136 ILQGKPLTLPFEGVDTFG-----NQVGFVKLAEGDHINSLLEIADAAKRTFQEKGILA----- 188
Orcinus_orca         158 ILQGKTLTLPFEGVDTFG-----NQVGFVKLAEGDHINPLLEIADAAKRTFQEKGILA----- 210
Trichechus_mana      158 ILQGKHLTLPFQGVDNFR-----NQVGFVKLAEGDHINPLLEIAETAERTFQAKGILA----- 210
Melopsittacus_u      139 LLKGKTVDLSFQGIHHFK-----NEVGFVKLAENDHTAILKEIAETMKKIFQEKGILA----- 191
Gallus_gallus        221 LLKGKTVDLSFQGIDHFK-----NEVAFVQLAENDHTAALSEIAETMRKIFQEKGILA----- 273
Anolis_caroline      125 LLQGKPLDLSFQGTDHFR-----NQVGFVKLSESDNTTTLLKIAEIVKNLFQEKGIII----- 177
Alligator_missi      164 LLQGKQLDLSFQGIDDFK-----NVVGFVKLAEGDCTAMLMEISETMKKIFQEKGILA----- 216
Danio_rerio          222 LLSGRRLVLPFCGIGHFR-----QEVYFVRIAEGEHLNTLALIAESVRKAFEERGITS----- 274
Ectocarpus_sili      156 VAAASPLMLSFRDLGHFR-----NKILFAKLVEDEQATRLRGLASSLHRRFSEAGLVEEAAGF 213
Zea_mays             241 ALENRPISIQLRGLTCMKGFPAKARVVYVPVLEVGSEGRLAHACKVITDAFIKAGLVF----- 298

cons                 379       :  :  :  .     :      :  :.  :  :      *    ..         *   *:       441

Mus_musculus         177 ----G-------------------ESRTFKPHLTFMKLSKAPMLRK--KGVRKIEP-GLYEQFI 214
Rattus_norvegic      216 ----G-------------------ESRTFKPHLTFMKLSKAPMLWK--KGVRKIEP-GLYEQFI 253
Homo_sapiens         211 ----G-------------------ESRSFKPHLTFMKLSKSPWLRK--NGVKKIDP-DLYEKFI 248
Pan_troglodytes      211 ----G-------------------ESRSFKPHLTFMKLSKSLWLRK--NGVKKIDP-DLYEKFI 248
Macaca_mulatta       211 ----G-------------------DSRSFKPHLTFMKLSKSPWLRK--NGVKKIDP-DLYEKFI 248
Nomascus_leucog      211 ----G-------------------DSRSFKPHLTFMKLSKSPWLRK--NGVKKIDP-DLYEKFI 248
Callithrix_jacc      211 ----G-------------------ESRSFKPHLTFMKLSKAPWLRK--NGVKKIDP-DLYEKFI 248
Oryctolagus_cun      210 ----G-------------------ESQSFKPHLTFMKLSKSPWLHK--NGVKKIEP-ELYEKFI 247
Bos_taurus           189 ----G-------------------ESRTFKPHLTFMKLSRLPWLRK--KGVKKIDP-KLYEKFI 226
Ovis_aries           211 ----G-------------------ESRTFKPHLTFMKLSRSPWLWK--KGVKKIDP-KLYEKFI 248
Pantholops_hodg      189 ----G-------------------ESRTFKPHLTFMKLSKSPWLWK--KGVKKIDP-KLYEKFI 226
Orcinus_orca         211 ----G-------------------ESRTFKPHLTFMKLSKAPWLRK--KGVKKIDP-KFYEKFI 248
Trichechus_mana      211 ----G-------------------ESRSFKPHLTFMKLSKAPWLRK--KGVKKIDP-ELYEKFI 248
Melopsittacus_u      192 ----G-------------------EERDFKPHLTFMKLSKSTPLRK--Q-VKKIDP-SLYEDFK 228
Gallus_gallus        274 ----G-------------------EERAFKPHLTFMKLSKSIQLRK--Q-VKKIDS-SLYEDYK 310
Anolis_caroline      178 ----G-------------------DDKAFKPHLTFMKLSKSPKLRK--QGVKKIDP-HLFENFK 215
Alligator_missi      217 ----G-------------------ENRAFKPHLTFMKLSKSPDLHK--Q-VKKIDL-NLYKNFK 253
Danio_rerio          275 ----A-------------------DDTAFKPHLTLLKLSRAPRLRR--Q--------------- 298
Ectocarpus_sili      214 PSRKGEKRGDGDGGGGSGSGTSSDSFEFTPHLTIMKTSKL---RD--RG-TLIPA-DSYDRYQ 269
Zea_mays             299 ---ER-------------------DVRELKIHATVMNVRHRKSRNKRNTWTDSFDARGIFGRFG 340

cons                 442                         :   :.  *  *.::    :                          504
```



```
Mus_musculus        215 DH-RFGEELLYQIDLCSMLKKK--------QSNGYYHCESSIVIGEKDRREPEDAELVRLSKR 268
Rattus_norvegic     254 DH-RFGEEILYQIDLCSMLKKK--------QSNGYYHCESSIVIGEKDRKEPEDAELVRLSKR 307
Homo_sapiens        249 SH-RFGEEILYRIDLCSMLKKK--------QSNGYYHCESSIVIGEKNGGEPDDAELVRLSKR 302
Pan_troglodytes     249 SH-RFGEEILYRIDLCSMLKKK--------QSNGYYHCESSIVIGEKNGGEPDDAELVRLSKR 302
Macaca_mulatta      249 SH-RFGEEILYRIDLCSMLKKK--------QSNGYYHCESSIVIGEKNGGEPDDAELVRLSKR 302
Nomascus_leucog     249 SH-RFGEEILYRIDLCSMLKKK--------QSNGYYHCESSIVFGEKNGGEPDDAELVRLSKR 302
Callithrix_jacc     249 SH-RFGEEILYRIDLCSMEKKK--------QSNGYYHCESSIVIGEKNGGEPDDAELVRLSKR 302
Oryctolagus_cun     248 SH-RFGEEMLYRIDLCSMLKKK--------QSNGYYHCESSIMIGEKDGGEPDDAELLRLSKR 301
Bos_taurus          227 GH-RFGEEVVHCIDLCSMLKKK--------QSNGYYHCESSIVIGPKPIGIQDLINEALRRER 280
Ovis_aries          249 GH-RFGEEVVHCIDLCSMLKKK--------QSNGYYHCESSIVIGDKNGGEPDDAELVRLSKR 302
Pantholops_hodg     227 GH-RFGEEVVHCIDLCSMLKKK--------QSNGYYHCESSIVIGDKNGGEPDDAELVRLSKR 280
Orcinus_orca        249 SH-RFGEEMVHRIDLCSMLKKK--------QSNGYYHCESSVVIGDKNGGEPDDAELVRLSKR 302
Trichechus_mana     249 SH-RFGEEMLYRIDLCSMVKKK--------QSNGYYHCESSIMIGEKNGGEPDDAELVRLSKR 302
Melopsittacus_u     229 SH-YFGNEILHRLDLCSMLKKK--------QPNGYYYCESSIVFGEKHAAEPDDAELVSLSKR 282
Gallus_gallus       311 SH-YFGDEILHRFDLCSMLKKK--------QPNGYYYCESSVFLGRIFICAVSD---VNLKRS 361
Anolis_caroline     216 NH-HFGDEPMTRLDLCSMMKKK--------QSNGYYYCESSIRVGEKKGAEPDDAELLSLSKR 269
Alligator_missi     254 SH-YFGNETLHRLDLCSMLKKK--------QPNGYYHCESSITVSEKNGAEPDDAELVSLSKR 307
Danio_rerio         299 ------------VSVC----------------------------------------------- 302
Ectocarpus_sili     270 NGFVVGHHAPSSVELSSMLEKEDVPPLEGWEPRPYYKCEHRLGLCT----------------- 315
Zea_mays            341 KA-EWGAYPIHEIHLSQRFKFD---------RSGYYYCCSSIPLPAE---------------- 377

cons                505             . :.                                               567

Mus_musculus        269 LVENAVLKAVQQYLEE--TQNKKQPG--EGNSTKAEEGDRNGDG--SDNN--RK 314
Rattus_norvegic     308 LVENAVLKAVQQYLEE--TQNKKQPG--EGNSVKAEEGDRNGDG--SDNN--RK 353
Homo_sapiens        303 LVENAVLKAVQQYLEE--TQNKNKPG--EGSSVKTEAADQNGND--NENN--RK 348
Pan_troglodytes     303 LVENAVLKAVQQYLEE--TQNKNKPG--EGSSVKTEAADQNGND--NENN--RK 348
Macaca_mulatta      303 LVENAVLKAVQQYLEE--TQNKNKPG--EGSSVKTEAADRNGND--NENN--RK 348
Nomascus_leucog     303 LVENAVLKAVQQYLEE--TQNKNKPG--EGSSVKTEAADQNGND--NENN--RK 348
Callithrix_jacc     303 LVENAVLKAVQQYLEE--TQNKNKPG--EGSSVKTEAADRNGND--NENN--RK 348
Oryctolagus_cun     302 LVENAVLKAVQQYLEE--TQNKKQPG--EGSSVKTGEAERNGND--SDHN--RK 347
Bos_taurus          281 MGLQSKVKEIKALLLKPEIQAKIRRELFEGRFINNSN---QGNDVDFSAT--LT 329
Ovis_aries          303 LVENAVLKAVQQYLEE--TQSKNKPG--DGSSVKTEEADRNGTD--SDNN--RK 348
Pantholops_hodg     281 LVENAVLKAVQQYLEE--TQSKTKPG--DGSSVKMEEADRNGTD--SG-N--RK 325
Orcinus_orca        303 LVENAVLKAVQQYLEE--TQNKNKPG--DGSSVKTEEADRNGTD--SDNN--RK 348
Trichechus_mana     303 LVENAVLKAVQQYLEE--TQNKNKPG--DGNSVKPEEADRNVND--SDYN--RK 348
Melopsittacus_u     283 LVENAVLKAVQQYLEE--TQNKTRQTD--GSPVKTEEAASGSKN--ESDNDNSK 330
Gallus_gallus       362 -----------------------------------------------------L 362
Anolis_caroline     270 LVENAVLKAVQQYLEE--TQNKNRQLDF-GAPVKTEEPTLGNNM--ENGNGSRK 318
Alligator_missi     308 LVENAVLKAVQQYLEE--TQNKTRQTD--GSPVKTEDATSGNRN--ESDSDNRK 355
Danio_rerio         303 -----------------------------------------------------V 303
Ectocarpus_sili     316 -------------------------------------------------P--AV 318
Zea_mays            378 ------------------------------------------------MH--TE 381

cons                568                                                        621
```

Figure S2. Protein multiple sequence alignment (MSA) of mAKAP7γ and eukaryotic homologs. MSA of *Mus musculus* (mouse), *Rattus norvegicus* (rat), *Homo sapiens* (human), *Pan troglodytes* (chimpanzee), *Macaca mulatta* (macaque), *Nomascus leucogenys* (gibbon), *Callithrix jacchus* (marmoset), *Oryctolagus cuniculus* (rabbit), *Bos taurus* (cow), *Ovis aries* (sheep), *Pantholops hodgsonii* (antelope), *Orcinus orca* (whale), *Trichechus manatus latirostris* (manatee), *Melopsittacus undulatus* (parakeet), *Gallus gallus* (chicken), *Anolis carolinensis* (lizard), *Alligator mississippiensis* (alligator), *Danio rerio* (zebra fish), *Ectocarpus siliculosus* (brown algae), *Zea mays* (corn). NCBI reference sequences NP_061217.3, NP_001001801.1, NP_057461.2, XP_518739.2, XP_001103953.2, XP_003255757.1, XP_002747004.1, XP_002714864.1, NP_001095736.1, XP_004011367.1, XP_005967580.1, XP_004263875.1, XP_004368981.1, XP_005154795.1, XP_004940279.1, XP_003215759.1, XP_006259840.1, XP_005173856.1, CBN75660.1 and DAA52752.1, respectively. Alignment was performed with the T-Coffee Expresso, which incorporates known protein database structures to aid alignment, with all MSA options selected (pcma_msa, mafft_msa, clustalw_msa, dialigntx_msa, poa_msa, muscle_msa, probcons_msa, t_coffee_msa, amap_msa, kalign_msa, fsa_msa, mus4_msa) to ensure high confidence in the alignment (1-5). To convey confidence in the alignment, scores indicate the percent agreement between all MSA algorithms utilized in the analysis for each protein and for the consensus sequence. Additionally, color-coding indicates positional confidence of each aligned residue based on agreement between

MSA algorithms with blue indicating the least and red indicating the greatest confidence in the alignment. Conservation of sequence is indicated by Clustal MSA symbols in the consensus line (cons) with "*" indicating fully conserved, "**:**" strong conservation of properties and "**.**" weak conservation of properties. Boxes indicate predicted nuclear localization signals (blue) (6-8), catalytic HxT motifs (yellow) and PKA RII-binding domain (black) (9).

1. **Notredame C, Higgins DG, Heringa J.** 2000. T-Coffee: A novel method for fast and accurate multiple sequence alignment. J Mol Biol **302:**205-217.
2. **Poirot O, Suhre K, Abergel C, O'Toole E, Notredame C.** 2004. 3DCoffee@igs: a web server for combining sequences and structures into a multiple sequence alignment. Nucleic Acids Res **32:**W37-40.
3. **O'Sullivan O, Suhre K, Abergel C, Higgins DG, Notredame C.** 2004. 3DCoffee: combining protein sequences and structures within multiple sequence alignments. J Mol Biol **340:**385-395.
4. **Armougom F, Moretti S, Poirot O, Audic S, Dumas P, Schaeli B, Keduas V, Notredame C.** 2006. Expresso: automatic incorporation of structural information in multiple sequence alignments using 3D-Coffee. Nucleic Acids Res **34:**W604-608.
5. **Di Tommaso P, Moretti S, Xenarios I, Orobitg M, Montanyola A, Chang JM, Taly JF, Notredame C.** 2011. T-Coffee: a web server for the multiple sequence alignment of protein and RNA sequences using structural information and homology extension. Nucleic Acids Res **39:**W13-17.
6. **Kosugi S, Hasebe M, Entani T, Takayama S, Tomita M, Yanagawa H.** 2008. Design of peptide inhibitors for the importin alpha/beta nuclear import pathway by activity-based profiling. Chem Biol **15:**940-949.
7. **Kosugi S, Hasebe M, Tomita M, Yanagawa H.** 2009. Systematic identification of cell cycle-dependent yeast nucleocytoplasmic shuttling proteins by prediction of composite motifs. Proc Natl Acad Sci U S A **106:**10171-10176.
8. **Kosugi S, Hasebe M, Matsumura N, Takashima H, Miyamoto-Sato E, Tomita M, Yanagawa H.** 2009. Six classes of nuclear localization signals specific to different binding grooves of importin alpha. J Biol Chem **284:**478-485.
9. **Hou T, Li Y, Wang W.** 2011. Prediction of peptides binding to the PKA RIIalpha subunit using a hierarchical strategy. Bioinformatics **27:**1814-1821.