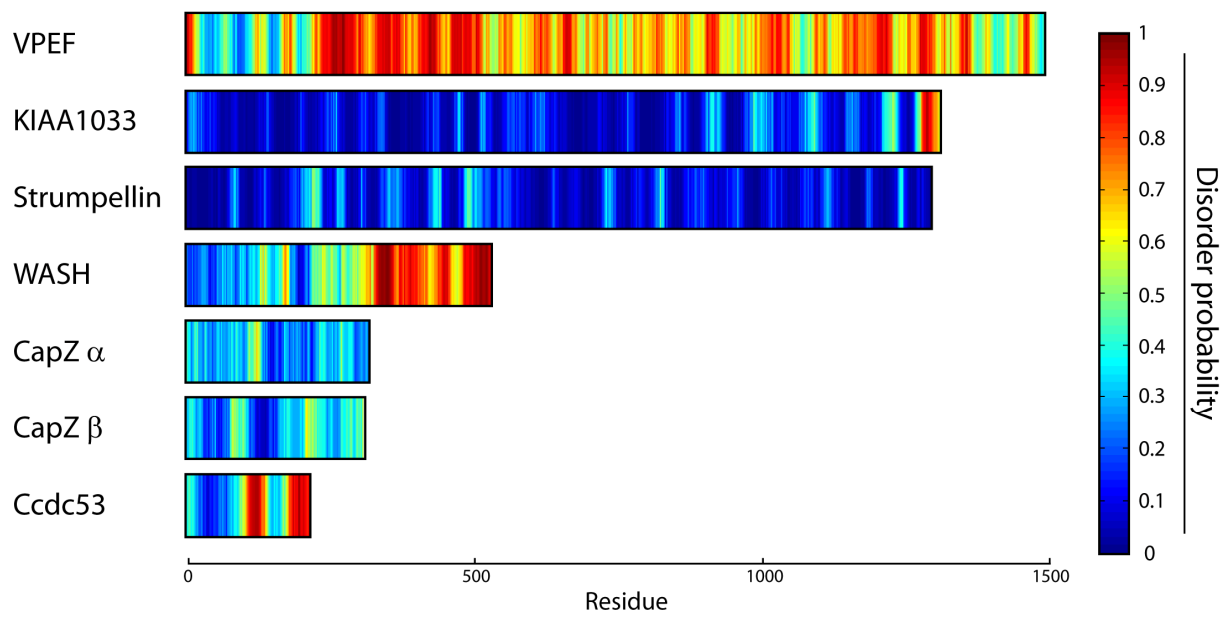


Species	VPEF	KIAA1033	Strumpellin	WASH	CapZ α	CapZ β	Ccdc53
<i>M. musculus</i>	gi|81885787	gi|126090572	gi|46048300	gi|83649760	CAPZ $\alpha 1$: NP_033927.2 CAPZ $\alpha 2$: NP_031630.1 CAPZ $\alpha 3$: gi|157951670	NP_001032850.1	gi|21313034
<i>H. sapiens</i>	gi|3043708	gi|121941472	gi|20070788	gi|29387278	CAPZ $\alpha 1$: NP_006126.1 CAPZ $\alpha 2$: NP_006127.1 CAPZ $\alpha 3$: gi|15277417	NP_004921.1	gi|7705622
<i>X. tropicalis</i>	ENSXETG0000007484	ENSXETP00000003997	gi|52345844	gi|62857419	CAPZ $\alpha 1$: NP_001017324.1 CAPZ $\alpha 2$: NP_001017254.1	NP_001093750.1	gi|62857347
<i>D. rerio</i>	gi|220679424	gi|125855266	gi|41055722	gi|134024982	CAPZ $\alpha 1$: gi|47086649 CAPZ $\alpha 2$: gi|169146111	NP_956229.1	gi|41055774
<i>D. melanogaster</i>	ND	gi|24642456	gi|116875735	gi|24652907	NP_611539.1	NP_477005.1	gi|19920908
<i>C. elegans</i>	ND	gi|115534026	gi|2088794	gi|17537245	NP_501145.1	NP_496336.1	gi|17534593
<i>Capitella sp</i>	ND	gi|Capca1|2885	gi|Capca1|174521	gi|Capca1|228200	gi|Capca1|163423	gi|Capca1|181882	gi|Capca1|6242
<i>L. gigantea</i>	ND	gi|Lotgi|1|158608	gi|Lotgi|1|177115	gi|Lotgi|1|83296	gi|Lotgi|1|179674	gi|Lotgi|1|164619	gi|Lotgi|1|106424
<i>M. brevicollis</i>	ND	gi|Monbr1|15671	gi|Monbr1|34678|	gi|Monbr1|22676	gi|Monbr1|32113	gi|Monbr1|35636	gi|Monbr1|22818
<i>S. cerevisiae</i>	ND	ND	ND	ND	NP_0122918	NP_012230	ND
<i>S. pombe</i>	ND	ND	ND	ND	NP_594639	NP_593619	ND
<i>D. discoideum</i>	ND	gi|166810804	gi|166805849	gi|16680963	XP_645243.1	XP_647630.1	ND

Supplementary figure 1. Accession numbers of orthologous genes encoding subunits of the WASH complex. ND: Not Detected.



Supplementary figure 2. Disorder prediction in subunits of the murine WASH complex. Disorder probability was calculated using the IUPred server (<http://iupred.enzim.hu/>). Disorder probability is color-coded with hot colors representing the highest probability.

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1      10      20      30      40      50      60      70
Mus_musculus  MNRTSPDSESRPPASEPVWERPWVEERRSSQNSLAADAGLLQFLQEFSQQTISRTHEIKQVDGLIQE
Homo_sapiens  MNRTTPDQELVPASEPVWERPWVEERRSSQNSLAADAGLLQFLQEFSQQTISRTHEIKQVDGLIRE
Xenopus_tropicalis MNGPANGS...AETPVWERPWGLEERRSSQNSLGADAGLLNFLREFSQQTISRTHEIKQVDGLIRE
Danio_riero   .....AEQWVERPWTLEEMQSSTNSLSLAADSGLFFLRDRFSQRMSKTHEIEKQVDGLIRD

80      90      100     110     120     130
Mus_musculus  TKATHCRLHNVFNDFLMLSNTQFIENRVVYDEEVEEQVLKAEA.EK.AEOEKTREOKEIDLIPKVQEAVNY
Homo_sapiens  TKATDCRLHNVFNDFLMLSNTQFIENRVVYDEEVEEPVLKAEA.EK.TEOEKTREOKEVDLIPKVQEAVNY
Xenopus_tropicalis TKATDCRLHNVFNDFLMLSNTQFIENRVVYDEEVEDHVVKADAGNK.FEOEKTREOQEASDLIPKVQEAVNY
Danio_riero   TKATDSRLHVFNDFLMLSNTQFIENRVVYDEEVEDPLPKSETTERQEPEOEKTREOKEASDLIPKVQEAVNY

140     150     160     170     180     190     200
Mus_musculus  GLQVLDSAFEQLDIKAGNSDSEEDDANERVDLILEP.KDLYIDRPLYLIGSRLFMEQDVGLGELSSEE
Homo_sapiens  GLQVLDSAFEQLDIKAGNSDSEEDDANGRVELILEP.KDLYIDRPLYLIGSRLFMEQDVGLGELSSEE
Xenopus_tropicalis GLQVLENAFEQLDIKAGNSDSEEEEVNERVEPLEPKDLYIDRPLLLIGSQQFMQQDVGLGDLSSEE
Danio_riero   GLKVLESAFEQLDIKAGNSDSEEDEVLEKVEPLEA.KDLYVDRPLYLIGSAFMDQDVGLGDLSSDE

210     220     230     240     250     260
Mus_musculus  GSVGSDRGSIVDSEDEKEEESDEDEFASHSDNDQN.....QHTTQISDEEDDDGDLFADSEKEGD
Homo_sapiens  GSVGSDRGSIVDTEEKEEESDEDEFAHHSDNEQN.....QHTTQMSDEEDDDGDLFADSEKEEE
Xenopus_tropicalis GSVDNDRGSIDSEDEKDDEVCLYIYLAYSNCSTSQ.....AHHSTLSDEDDNGSDLFGDSEKEEE
Danio_riero   MSIGSDRDSVLSEDVEDGDEHTDQD...DYSDQDEVQGNFKKKPSIASYNDADEENDDSDLFGGSDKDED

270     280     290     300     310     320     330
Mus_musculus  DIEDIESAKSK...RPTSFADELAARIKGDISNORKEGOT.....DGKPQKTVKEKKERRTPADDEDIL
Homo_sapiens  DIEDIENTRPKRSRPTSFADELAARIKGDAMGRVDEEPTLPSGEAKPRKTLKEKKERRTPSDDEDNL
Xenopus_tropicalis DIIVENAFEDNKTTKRTPTSFADELAARIKGDIPRTQESDSQ.....CGHTLAVLKETQPSIPSDEPEDDF
Danio_riero   .....EDDLRKDTGVP.SFADELAARIKGETQNKPEADRSLSSGPSTTSKKSKTKNVKPQVEDDQDEM

340     350     360     370     380     390     400
Mus_musculus  FPPPTLTDEDFSPFGSRGLFSNGQLFDDEDES.DLFKEAPRARAQAPVSEELPPSPKPGKKIPAGAV
Homo_sapiens  FAPPKLTDEDFSPFGSGGLFSGKGLFDDEDESDLFTEASQDRQAGASVKESSS...KPGKKIPAGAV
Xenopus_tropicalis FKPPKLTDEDFSPFGSGGLFSGKGLFDDDDEVCFSDVTFTFNLVMPLSNKFQHS.....
Danio_riero   FRPPTMEDEEYSPFGSGGLFSGKGLFDDDDEG.DLFSEAPKNVPVEKEKTVAQPAPHKTKKIPTGAV

410     420     430     440     450     460
Mus_musculus  SVLLGHPDVSGSTSAPSLKELQKHGQPTPGKSSHLPTPACLFDDDDNDNDEDDDNFMPSSKSKPS...KTD
Homo_sapiens  SVFLGDTDVFGAASVPSLKEPQKEPTPRKSPYGPPTLFDDDDGDDDD...FFSAPHSKPS...KTR
Xenopus_tropicalis DIIVENVIGS.SILAEKDKNKSTTPTQRKSVPKPPSSLFDDDDGA.....FFGSSNHTTNKPD
Danio_riero   SIFPGNS...LLGSANDSESPKSSDSRSALPKASIG...GLFDDDDDDD...FFSGKTQSKTPGQD

470     480     490     500     510
Mus_musculus  KVKS...TAIIFD.....DEGDFKEKAE...ALPAASVSQTHESKTRADKT.....IAL...PSSKN
Homo_sapiens  KVQS...TADIFG.....DEEGDFKEKAV...ASPEATVSQIDENKAREK.....VTL...SSSKN
Xenopus_tropicalis KSQP...TADLFA.....DDN.DLFQDKPV...APILAKNKVTKENEPPKENN.....IEI...SKNHQ
Danio_riero   KKTPKKTVDLFGEADEDEDDDDTAMFSGKAISALPQDISANGEEETRPPEKKPPAGAVSMFGPGTKN

520     530     540     550
Mus_musculus  L.....KL.....VSETKTQKGLFSDEDESE...DLFSSQ...SSSKPKSA
Homo_sapiens  L.....KP.....SSETKTQKGLFSDEDESE...DLFSSQ...SASNLKGA
Xenopus_tropicalis V.....PVEKSPLE...SSTKKQTKGLFSDEDESESDLFSPIPSASKSKTA
Danio_riero   LEGLKKRRPSTSESTKSESGHAPEVKSSPALGSAEKMQSKSLFSDDEDSQ...IFSSETSKSKPTT

560     570     580     590     600     610     620
Mus_musculus  SLPSSQPPTSVSLFGDEDEDSLFGSAAKKQTSSLQPQSQEKAKPSEQPSKKTSALLFSSDEDQWNIA
Homo_sapiens  SLLPGLPTSVSLFDEDEDEDLFGGTAAKKQTLSLQAQREKAKSELSKKKASALLFSSDEDQWNIP
Xenopus_tropicalis TLPAAKTGKALSLFDEDED...LFASVDPKKQTAPVTKPAQNKLTSEKAPKSG...LFSSDEDPIGTL
Danio_riero   QNKPSKAPLSI...FDEEED...LFSS...PKPVPVKTSLPPKNALSSLF...SDDESQWMSL

630     640     650     660     670     680     690
Mus_musculus  DSHTKLASDNKSKELDWDSGATQGEAKAVKTNLFEDDDDDEVDLFAIAKDSQK...KTQRTSLLFED...DA
Homo_sapiens  ASQHLASDSRSKGEPRDSGTLQSQEAKAVKTSLFEEDKED...DLFAIAKDSQK...KTQRVLSLFED...DV
Xenopus_tropicalis NQKNTVEKTQPAKAAVVSKGTREEPLG...KKSLFDNDTD...DLFAITKESEK...KHNRVSLLFED...DN
Danio_riero   KSSKENEVKPSGMKPSISAPSRLPSVKTHKDGLFDDKDDE...DLFVATNOSSKTSSQRVSLLFED...DD

700     710     720     730     740     750
Mus_musculus  ESGSSLFGLPPTSVPSATTKKEVSVPK...VPLLFSDEESEVPSGVK.....PEDLFVDNARVSPEVG
Homo_sapiens  DSGGSLFGSPPTSVPPATKKKETVSEAPPLLFSDEEEKEAQLGVK.....SVDKKVESAKSLKFG
Xenopus_tropicalis E...GSLFSS...VSTAASTSOAPVNTIVMLCFVLQESKLPDTHALISKKESLLTKPTEGQKSEPE...
Danio_riero   EDKEPLFGF...KTPAIKTPPESKTSGVSLFESTEEDTGPSVVKEKITEEKKPVE...SVPSDDSFVK

760     770     780     790     800
Mus_musculus  SADVASIAOKEGL.....LPASOEAGGPSDIFSSSPL...DKGAKGRTRVLSLFDEDDKVE
Homo_sapiens  RTDVAE.SEKEGL.....LTRSAQETVKHSDLFSSSPW...DKGTKPRTKVLSLFDEDDKME
Xenopus_tropicalis .PPVSVCENKE.....PLQENKKPGEDNLFAASPA...DKHAKIKSKNVLSLFDEDEDF
Danio_riero   KKPAGAVSLFGGIDILGDKQDTIKPKPKQEEIPDDELQKEGPPMESKGTKK...KTALSLFDDDD

810     820     830     840     850     860
Mus_musculus  DE...SSTCAPQDGREK.GLKTDS.....RPKSTGVFQDELLFSHKLQKDNDPDVDLFAGTKIRSSVP
Homo_sapiens  DQ...NIQAPOKEVGK.GCDPA.....HPKSTGVFQDELLFSHKLQKDNDPDVDLFAGTKTKLLEP
Xenopus_tropicalis NH...TDKTITQRIPGKVSSETS.....HKRTGVFQDELLFSQLQKDNDPDVDLFASAKPPSEKP
Danio_riero   DDFSTDEITPAPTASR...STEKNALKEHGPRMKSTGVFQDELLFSQTQRDNDPDVDLFATSPKAPEVP

870     880     890     900     910
Mus_musculus  S.....GSLFGDDEDDDLFSAKTQ...PVVPEKKG.....PLKKDHPV...SLKNQDPLDST
Homo_sapiens  S.....VGSLFGDDDEDDDLFSAKSQ...PLVQEKKR.....VVKKDHSVNSFKNQKHPESI
Xenopus_tropicalis SHTKSSAGMGLFGDDDEDDDLFSTAKPRKPIVSFKQNSLVPFLLCNPYSCRRNHSFILINKCPADS
Danio_riero   QSSAKSVAPTLFGDDDEDDDLFSAKPRKAPKVEKPKKS.....KPKTNEIDRSISS.....

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920      930      940      950      960      970      980
Mus_musculus QGSKEKSTWKTEPAQDSSGLTPFKSREPPSSRIGKI QANLAINPAAQLP TVALQIPG TKPVSE LAFPSSSE
Homo_sapiens QGSKEKGIWKPE...TP... QANLAINPAAQLP TAAASQISEVKPVLPE LAFPSSSE
Xenopus_tropicalis ... VSIKSKGPPSSRIGK L QANLQINPAAQLP GAVPKLAGVRPAIVG ISPP...
Danio_riero ... KAVLALNPAQLLP GAVPRAPG AVSIVIPGLAH...

990      1000     1010     1020     1030     1040     1050
Mus_musculus PGRSHIL ESVPVLPGLSVEA GVSFDLPAQAD TLHSANKSRV KVRGKRRPQ TRAAAR LAAQESSEA...EDVT
Homo_sapiens HRRSHGL ESVPVLPGLSVEA GVSFDLPAQAD TLHSANKSRV KMRGKRRPQ TRAAAR LAAQESSEA...EDMS
Xenopus_tropicalis PLADTMD NSTSPTASTGIQ GVSFESPAQID TLHSANKARPR.NARRRP TRMERK LASQDSGET...ID...
Danio_riero TGLPAAA RTMPDHQGSSEG GVSFDSPALI STL LNANKGRAK GAGKRRPQ TRAAAR LAAQESSEA SGENVVS

1060     1070     1080     1090     1100     1110
Mus_musculus VDRG.PVAQLSSSPVLPNGHQ PLLQPRMA..SGQTSSE...TATAFPW EGGPVLSAAD RSFFVK SRPQTG
Homo_sapiens IPRG.PI AQWADGAI SPNGHRPQL..RAA..SGEDSTEEAL AAAAPW EGGPV.PGVD TSPFAKSLGHSR
Xenopus_tropicalis ... DSGVSP TSHTAATTP ELAQLNSHQQFDSTV SNMKQSL SENDVQSRVN TK...VTTKPLTP
Danio_riero VQKNPEPAMAASLPPFN PVSVP...SALTIPV SAPAPAKSPDEA...VRPKRFLE

1120     1130     1140     1150     1160     1170     1180
Mus_musculus N EADLFD S GDI FPK...SRGSQ SVE GAGVMA..G EPPSH SSGGRKE KSLAF PDLSEG S STE DLFQSVKPR
Homo_sapiens G EADLFD S GDI FST...GTGSQ SVERTKPKAKIA ENPAN PVPVGGKA KSPMFPALGEAS SDD DLFQSAKPK
Xenopus_tropicalis N INDLF G S.DLF AKRSLPPADAS K KQDGPDP..NS SANKPGLGTG T KSPA.SVIDEQNS DDDLFQTVKQK
Danio_riero P TD DLF D SDD L F A T K P V S S K K H I Q T T E E G Q K K V S N T E D V T P S K K D Q A P S I F D ... S H D E D L F A T V K P K

1190     1200     1210     1220     1230     1240
Mus_musculus A A K N R N P F P L L E . . . D E . . E D L F A D P R G . K K N E R K P D S H Q D S V S K T H D I F E D D I F A T E A I K P F P K K R E K G
Homo_sapiens P A K K T N P F P L L E . . . D E . . D D L F T D Q K V . K K N E T K S S Q O D V I L T T Q D I F E D D I F A T E A I K P S Q K T R E K E
Xenopus_tropicalis S V K M P K G A S L V D . . . N E P S D D L F R V S K S O K K V D I K T V Q F K E T K S K A S N I F E D D I F A T E V V K V K T K E K K
Danio_riero S V Q K A K H M P F L D E G G E D S D E D L F G A G K S . K S L E S K . N S K K E A S A V R S D I F O D E V . . . K E P E K A Q K N P K E

1250     1260     1270     1280     1290     1300     1310
Mus_musculus R T L E P N L F D D N I D I F A D L . . T V K P K E . K S K K K V A A K S M F D D D T D D I F S S G L Q A K A S K P K S Q S A E A A S . . E
Homo_sapiens K T L E S N L F D D N I D I F A D L . . T V K P K E . K S K K K V E A K S I F D D D M D D I F S S G I Q A K T T K P K S R S A Q A A P . . E
Xenopus_tropicalis P P S E S N L F D E N V D I F A D L . . T Q K G K E K K A K K K V E P K S I F D D D M D D I F A S G . S V K H T K Q K A K P S E T S A . . E
Danio_riero A S L D A S L F D D V D I F A D L T G T S K P K E K K A K K K V E T K S I F D D D M D D I F S T G T T K P T V K P S S K S K K S Q P I O E

1320     1330
Mus_musculus Q R S E H K V A . S I F D D P L N A F G S Q
Homo_sapiens P R F E H K V S . N I F D D P L N A F G G Q
Xenopus_tropicalis V K S E S N V S . S I F D D P L N V F S K .
Danio_riero P A S T A E T A H N I F D D P L N A F G G N

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Supplementary figure 3. Alignment of VPEF orthologs.

Sequences were aligned using MUSCLE (<http://www.drive5.com/muscle/>), and the alignment was rendered using ESPrnt (<http://esprnt.ibcp.fr/ESPrnt/ESPrnt/>).

Mus_musculusMAVDTLSPDWDFDRVDDGSKIHAEVQLKNGYGRFLEEYTSQLRRTEEDALDLSIGDVFDFNLDPIA
Homo_sapiensMAVETLSPDWEFDRVDDGSKIHAEVQLKNGYGRFLEEYTSQLRRTEEDALDLSIGDVFDFNLDPIA
Xenopus_tropicalisETISPDWEFDRIDDGSKIHAEVQLKNGYGRFLEEYTSQLRRTEEDALDLSIGDVFDFNLDPIA
Danio_rieroMAVDSLSPDWEFDRVDDGSKIHAEVQLKNGYGRFLEEYTAQLQTEEDALDLSIGDVFDFNLDPIA
Drosophila_melanogasterMSPVVEVNFVFMGNDSMAP
Caenorhabditis_elegansMTEFNPTSDQILEAKEDVRNEQQELMDELTEHHDHITRFKKNKFA
Capitella_spMGTVNKEEWTDFDQDGLKIVGEVQLRKYGFLEDFAGQLKTEDEALGESIGDSDWDLTLDPIA
Lottia_giganteaMASSTDWEFDFDDGSKIHAEVQLKNGYGRFLEEYASQLKTEDEALDLSIGDAWMSLDPIA
Monosiga_brevicollisMKEFLDTHAQQQLVVDVDAIGDGDWLDLNDPIA
Dictyostelium_discoideum MATSYSANNGQNEEYTFDAFEDGSSKLVGEQQLTKLNQFAVDYAAQIWKTEEDALDLELNEVVDINIDPVS

Mus_musculus LKLLPYEQSSLEELIKTENKVLNKVTITVYAALCCETIKKLYEAE
Homo_sapiens LKLLPYEQSSLEELIKTENKVLNKVTITVYAALCCETIKKLYEAE
Xenopus_tropicalis LKLLPYEQSSLEELIKTENKVLNKVTITVYAALCCETIKKLYEAE
Danio_riero LKLLPYEQSSLEELIKTENKVLNKVTITVYAALCCETIKKLYEAE
Drosophila_melanogasterDRSFEESLVANKPLTTLANLNCQCRNLSRKA
Caenorhabditis_elegans FADAEAQTAIISLINCEDKFVEAYMVTQVKVYQSRKRVFAHY
Capitella_sp LQVLPHYEQSVLQLIKTDNKLNKVTITVLAALCTELDSLKHEAE
Lottia_gigantea LQMLPHYEQTNLNLVKTDNKLNKVTITVLAALCTELDSLKHEAE
Monosiga_brevicollis LDTPHAEAVVVLVWTEQVSDLSKRHASVSTSVAPSAKTRGLDSIFSKVMATFVALCNEMQLQREAE
Dictyostelium_discoideum IYNKPHQLDLTELKVTDHKFNKVTITVFSICNQRILKETA

Mus_musculus TKFYNGLLRYGEGATDSMVEGDCQIQMGRFVSLFQELSCFVTRCYEVVMNVVHQLAAL
Homo_sapiens TKFYNGLLRYGEGATDSMVEGDCQIQMGRFVSLFQELSCFVTRCYEVVMNVVHQLAAL
Xenopus_tropicalis TKFYNGLLRYGEGAAESIVEGDSQIQMGRFVSLFQELSCFVTRCYEVVMNVVHQLAAL
Danio_riero TKFYNGLLRYGEGVDSVEGESQIQMGRFVSLFQELSCFVTRCYEVVMNVVHQLAAL
Drosophila_melanogaster KRFFQALFLFSDPRLDDTLPLPHTHTSEGSAGLEGSVRMSSSMDFFCQYFLLNRMIVILQNLWRQTAAL
Caenorhabditis_elegans KNIRNMYLFLTABEELMDTDGHRINNLVAFIIGNMYCNLLRLS DALTLCEATRSQI
Capitella_sp NKFYNALLRYGEGTEGESPDGRAQIQMGRMPLFQELSCFVTRCYEVVMNVVHQLAAL
Lottia_gigantea TKFYNALLRYGEGEPEGLEEGEAQVQMGRIPLFQELSCFVTRCYEVVMNVVHQLAAL
Monosiga_brevicollis EELYAPLHRYGEGMHDQAEOQEGDAQLCFAKMLPVLQHLATFTSRVYVVKNVVQPFAMM
Dictyostelium_discoideum SKFYSPLTIVFGEITGESEGDVQIEVQKLLPFMIDL SAFVNR CYS LRNIISQFASI

Mus_musculus YISNKIGPKIIETTG VHFQTMYEHLG ELLTVLLTLDEITVDNHVTLKDHWTMYKRLKLSVHHPNSKFGIQ
Homo_sapiens YISNKIAPKIIETTG VHFQTMYEHLG ELLTVLLTLDEITVDNHVTLKDHWTMYKRLKLSVHHPNSKFGIQ
Xenopus_tropicalis YTSNRNEPKIIETTG VHFQTMYEHLG ELLTVLLTMDEIENHATLKDHWTMYKRLKLSVHHPNSKFGIQ
Danio_riero YNSSKGATKIIESTG VHFQTMYEHLG ELLTVLLTLDEIENHATLKDHWTMYKRLKLSVHHPNSKFAIP
Drosophila_melanogasterSVSPMDINEVHIFAVFDAMS ELLHEIVVFNELANQSKISTWMLYKRLMNLNSQSANLELN
Caenorhabditis_elegansKTSHFFPLKKSASFQVYVHKAIEIMYFAAVDHLAALYPDLGKIFCDFQKRRLKKHFLEDTTPA
Capitella_sp YSNGKSSPIVMDVSNVHFQVYEHLEITVLTLDSEIENQNMKLEHNTLVKRLKLSVKHPNQRPNIP
Lottia_gigantea HNSYKSGPKLIDVTD VHFQVYSHMA DLLGVLTITLDSIISNQSFI RDHWMLYKRMVKS VRHPDGPKNVP
Monosiga_brevicollis YTSKISAQTIDPRGVHLLHTVFRNLGNLLMCMATLDELIFQNAL LARHKDHYKRLM KHIKSHSQPQT
Dictyostelium_discoideum YQSCKNIHTQFFKNVHLLQAVYYSN DIFSVLINLDSITITQNTALLSSWGRYLRMLKLSVKQEPNKVSVS

Mus_musculusEEKLPKFFKFLKLEGQLLDGMIFQACEQQFDSLNGGIVSVSKNSTFAEEFAHSIRSFANVBAKLG
Homo_sapiensEEKLPKFFKFLKLEGQLLDGMIFQACEQQFDSLNGGIVSVSKNSTFAEEFAHSIRSFANVBAKLG
Xenopus_tropicalisEDKLPKFFKFLKLEGQLLDGMIFQCGVEQRFDNPGENVSVSKNSAFAAEFAYNIRTFANVBAKLG
Danio_rieroEEKLPKFFKFLKLEGQLLDSMIFQACEQRFNDNPGENVSVSKNSAFAAEFAYNIRTFANVBAKLG
Drosophila_melanogaster GLSTSLMDIENLITKDFRILLDNLMELKQFGLNSVSPITQHSNAYIRROLLDVADNPS
Caenorhabditis_elegansQRKAYDEGARAEADAQSMILKNCFRTLYESSGGDMNLLNFANEMKEAIGDLLTWSVKTS
Capitella_spDEKLRPFKFLMLEGQLLDGPIQNCVEQIFDQGQMLVTKNLSLFAEEFALNIRSYLSELPRFLG
Lottia_giganteaEEKLRPFKFLMSLEGQLLDGMIFQNCVEQIFDQNTINCSKNPNLAAEFAINIKDLVLEBGRIG
Monosiga_brevicollisREQMPFFKFLKILEGQLDGMIFQRCVDFDDTVMVSPNTILOGEFLELRLNLAALBARV
Dictyostelium_discoideum GEEDKLWQLEKLLSLKQLLLEGFIQSCIQEFDFFGVIDVKGKLVLKAEEFYQNVKLVLSMFGTKIM

Mus_musculus EPSRIDQRDKYVGI CGFLVLFHQIFRTVDKFFYKSLDICKKVPATITLTAANIWFNDNFI IHKMPAAAK
Homo_sapiens EPSRIDQRDKYVGI CGFLVLFHQIFRTIDKFFYKSLDICKKVPATITLTAANIWFNDNFI IHKMPAAAK
Xenopus_tropicalis EASRIDQRERYVGLCGFLVLFHQIFRTVDKFFYKSLDICKKVPATITLTAANIWFADHFI IQKVPAAAK
Danio_riero EPSRIDQRDKYTVGCGFLVLFHQIFRAVDKFIYKSLDICKKVPATITLTAANIWFADHFI IHKMPAAAK
Drosophila_melanogaster NELKNYEDPKKHILRLTFVVVYVHLEGLIQMEGSLKNNVLDLVARHKQVPLNRSVFWPSSGFLRLAKLTLMK
Caenorhabditis_elegans AQTTRDGRFFCGISALTYVYHHPNFVBTGLLIRKVVQAASKVYVYRMLGEEVLFVPMFEFSREISNKNKI
Capitella_spETNEVNHHRHSLVGTIALYVLFHQIFRVRIDKFIKQFWDLYKKIPGVWLLGISIINWPNEFQSRKLPHMAK
Lottia_giganteaENNEIDHRYKFFVGVCGFLYILHFQIFRVVDKFLFQKLVWDFIYKKIPCWHMGNVWVPMFEFQFRLPNIDQ
Monosiga_brevicollisTPKDRRRNDFMGLVCNYILFETIFRSQDRRMLKSIWDLQKLPVAVHVIYGTIVVMPNDNFI IQLKLPHLKA
Dictyostelium_discoideumDSSLNLRERFPGFMLYAFYIALFKDITDKSFFKQVWVETKRVPMSLVNVVWFVFPADFI IQLKLPGMK

Mus_musculusLDLDRKSLQAIKIHRDTP LQQKAQSLNKDVQSSYVYFVSSWMMKMESELSKEQRMDTFABEDLT
Homo_sapiensLDLDRKSLQAIKIHRDTP LQQKAQSLNKDVQSSYVYFVSSWMMKMESELSKEQRMDKFAEDLT
Xenopus_tropicalisLIDKKSLQAIKIQRDSYLP LQQKAQSLNKDVQSSYVYFVSAWMMKMESELSKEQRKAEKFAEDLT
Danio_rieroLMDKKSLQSI RSRSDVFLQQAQTLMKMDQSSYVYFVTSWMMKMESELSKEPKDKLSDELS
Drosophila_melanogasterSSARSQDGGPKVHSTVLEKFRSDQRTICQGLVQLSLWSIQMQRVFDVGVFGLK
Caenorhabditis_elegansFDSKTEIFAKKLVEEASSISKDRADEMPLKEVKEYCEHASTWMLFQQKRRDQTEAITKLPOWGLDVSELN
Capitella_spALDKKALQTAGQARLWQKKNLVSEAQSWYVSVTSWMMKMESEFSGTGALVDDL
Lottia_giganteaLDRKAQLAVQTQTTW LQQKQLLRDIQVYSTQVSAWMMKMESELARGGTLMEDLN
Monosiga_brevicollisLVDKKFAQRPWDRPHAHAFAGHRLTRSEAQNIYRRVVAWVQFDACKFRPEMSDMELE
Dictyostelium_discoideumIVGSTFNHMEIRRDYLRNVDKFESGRVKSYYL VSRWMMKMESEQTRGGTLVWVSL

Mus_musculusNR CNVFIQGF LLYAYS ISTIKKTMLNLYMSMQKPMTKTSVKALCRLVELLKAIEHMFYRRSMVVAADVSHI
Homo_sapiensNR CNVFIQGF LLYAYS ISTIKKTMLNLYMSMQKPMTKTSVKALCRLVELLKAIEHMFYRRSMVVAADVSHI
Xenopus_tropicalisNR CNVFIQGF LLYAYS ISTIKKTMLNLYMSMQKPMTKTSVKALCRLVELLKAIEHMFYRRSMVVAADVSHI
Danio_rieroNR CNVFIQGF LLYAYS ISTIKKTMLNLYMSMQKPMTKTSVKALCRLVELLKAIEHMFYRRSMVVAADVSHI
Drosophila_melanogasterTFLOLLLNHSHYADQVNLLAVALLNHRVALLMTPMTRNDWIVVSRLLQYLKVIQKTFESNQIFRVRFVTSLS
Caenorhabditis_elegansLKCIRILETITRDLYLLLRSKRGEHDHFRIEIDRNSAYALIRA IETVKRLEHLPVLDNWSITIEGSEFLA
Capitella_spHRCLRFIQGLLYAYNLQHLKLTMLNHLIDLRKPMTRTSVLAALCRLIAELKAIETHFRRSMLVAESVNH
Lottia_giganteaNRVAVLFIQGLLYACNLHLIRTVLNLHVALQKPMKTAVLSLCKLVELLKAIEHMFYRRSMVVAADVSHI
Monosiga_brevicollisAQSNFLLQGLLFAVQLRHLLTFLVLHAELOVKLNSAHVREVLRLAQLLKAIEHMFYRRSMLVAEIQS
Dictyostelium_discoideumSKVGIQVQLSYHLSHLKLTMLNHLIDLRKPMTRTSVLAALCRLIAELKAIETHFRRSMLVAEIQS

510 520 530 540 550 560 570
Mus_musculus T O H L Q H Q A L S S I S V A K K R V I S D K K Y S E Q R L D V . . . L S A L V L A E N T L N G P S T K Q R R L I V S L A L S V G T Q M K T
Homo_sapiens T O H L Q H Q A L H S I S V A K K R V I S D K K Y S E Q R L D V . . . L S A L V L A E N T L N G P S T K Q R R L I V S L A L S V G T Q M K T
Xenopus_tropicalis T O H L Q H Q A L A A T A V A K K R V I S D K K Y S E Q R L D V . . . L S A L V L A E N T L N G P S T K Q R R L I V S L A L S V G T Q M K T
Danio_riero T O Q L Q S Q A L V S I S M A K K R V I S D K K Y S E Q R L D V . . . L S A L V L A E N T L N G P S T K Q R R L I M S L A L S V G T Q M K T
Drosophila_melanogaster I Q W Q K Q K V I H L L H T T K K K I V V . L K L L O R K I N F . . . L A T I K L A E K S I M G P S K O R L T F V N L A L G E F L D N R L
Caenorhabditis_elegans R Q Q W R K H M L R I L S E A R K S Y V S K S K N I S V I E A A T K R S F Y H I A E A Q C I N E M I P S R N V V L G L A Y E I G R L E T H
Capitella_sp I O H L S F I A L S T V Q T A K K R I V A D R K Y N E K K L D V . . . L S A L F M A E N C L H G P G T K E R R L I I O L A L A V A M Q L K V
Lottia_gigantea I O H L C F N A L S S I A L A K K R I S D K K Y S E R R L D V . . . L S A L V L A E T A L H G P G S K E R R L I L K L A L S V G T K M K A
Monosiga_brevicollis G O H L A Q T C T N L V T Q A Y D Q S T K R A N L F P R E L D V . . . Q S A L E L L R R C C I G P S T R L R K L A C E V A V H I A T G S K Q
Dictyostelium_discoideum V Q L T D I I N E K L N V V R S K Y A G R S N Y S E I E L D V . . . I V A L S L C S D L L C G V A T N E R I T V V R L C L N V I Y Q S N I

580 590 600 610 620 630
Mus_musculus F K D E E L F P L Q V V M K K L D L I S E L R E R V Q A Q C D . . . C C F L Y W H R A V F P I Y L D D V Y E N A V D A A R L H Y M F S A L
Homo_sapiens F K D E E L F P L Q V V M K K L D L I S E L R E R V Q T O C D . . . C C F L Y W H R A V F P I Y L D D V Y E N A V D A A R L H Y M F S A L
Xenopus_tropicalis F K D E E L F P L L L V M K K L D L I S E L R E R V R S O C N . . . C C F L Y W H R A V F P I Y L D D V Y E N A V D A S R L H Y M F S A L
Danio_riero F K D E E L F P L Q L V L K K L D L I S E L R E R V K V C D . . . C G F L Y W H R V T F P I Y L D D V Y E N A V D A A R I H Y M F S A L
Drosophila_melanogaster L P A D N Q K L I K S I L H R V S I S D I M R N I G Q L A N T S E S S L V Y N H W F L D T S V L K E Y T R L Q R N P S Y L Q N L V S V S
Caenorhabditis_elegans I S S P N R K Q V Q D L M N R L E T F N S P L R L G K Q A A F . . . T G L L L S H S W L P H M Y F D A L T Y R K P D V S I E G F S A L
Capitella_sp F K D E E L A S L Q G V L L K L D V I C D I R E R L R E A C D . . . C S F F Y W H Q V I L P I Y F N D L F E T A V D I H K I H Y M F G V L
Lottia_gigantea F K D D E L N T L A E T L R K L D A I C E F R E K V R Q A C D . . . C S F I Y W H R V I L P L Y L T D L C N V T D T H R I H Y M F T A I
Monosiga_brevicollis F P P A H V E K F L R T R E R L D M H S L R D E I N R A C D . . . A S F F Y W H R H L F G L Y L R D M Y R E P L E A Y R L P Y M M A T L
Dictyostelium_discoideum L K E N D I E E L R L H I K R L F E I S D I G K I V K A S C D . . . C S I L F W S R D L F P T Y L Q F L Y Q N P S Q A T S L Q Y T L T G L

640 650 660 670 680 690 700
Mus_musculus R D C V P A M H S R H L E S H E I . L L D C Y D K E I M D I L N E H L L D K L C K E I E K D L R L S V H T H L . . . K L D D R N P F K V
Homo_sapiens R D C V P A M H A R H L E S Y E I . L L D C Y D K E I M E I L N E H L L D K L C K E I E K D L R L S V H T H L . . . K L D D R N P F K V
Xenopus_tropicalis W S C V P D M M Q A R H L E S Y E V . L L D C Y D K E I M A V M T E H L L D I L C K E I E K D L R L S V H T H L . . . Q L D E R N P F K I
Danio_riero R D C V P T M L H A K H M E S C Q . L L E C Y D T E I M E I L N E H L L D K L C K E I E K D L R L S V H T H L . . . K L D D R N P F K V
Drosophila_melanogaster H H L D K I M A M F R G S R C P K O S A N D L I E F L S N H L E F F L R V E A L S H L . . . F Q S Q D P F F Q Q
Caenorhabditis_elegans G G F . . . M E G A K I T Q G S M Q . I L T K L E T I M . . . N T L I V K M G A I D L D L R I Q A N T H L A V G K T E Q D G A P . D E
Capitella_sp R D C V Q P M T R T K H H E N P K I . L L E S P D R E V I M K N L N E H L L S P L C R D I E T D L R I H T H L . . . Q L D D R N P F K T
Lottia_gigantea K D C V S P M L R V K H L P D S T E . L L T V P D K E I M A F L N D N L I D P L C R Y I E T D L R I H Q H L . . . Q L D D R N P F K V
Monosiga_brevicollis Q D C . . A I V A K R A Q D S T G E P I L T E L H K E I F A E L Q Q H I I E P L C L D I E D L R F Q A L T D A V H R R D K E S R N P L K A
Dictyostelium_discoideum K D V V S V L D K A I H V D N A K Q R L I D V Y R N E M E M I D K N I I Q P L G K D V E T D L R H I H A F L . . . N I E E K D P F K T

710 720 730 740 750 760 770
Mus_musculus G R K D L A L F F S . L N P I R F F N R F I D I R A Y V T H Y L D K T F Y N L T T V A L H D W A T Y S E M R N L A T Q R Y G L V M T E A H L
Homo_sapiens G M K D L A L F F S . L N P I R F F N R F I D I R A Y V T H Y L D K T F Y N L T T V A L H D W A T Y S E M R N L A T Q R Y G L V M T E A H L
Xenopus_tropicalis G M K D L A H F F S . V K P I R F F H R F I D I K A F V T H Y L D K T F Y N L T T V A L H D W A T Y S E M R N L A T Q R Y G L T M T E P H L
Danio_riero G M K D L A H F F S . L K P I R F F N R F I D I K A Y V T H Y L D K T F Y N L T T V A L H D W A T Y S E M R N L A T Q R Y G L V M T E A H L
Drosophila_melanogaster S A L D Y R L C I N . A V A V E N D G D Y N I . L K D H L E N Y F T A T F Y N L T T A P H D W K S Y E K M R L A N K V L Q P I D D H L
Caenorhabditis_elegans E M E Y F G Y L I K T V Q K F Q V A T T V I P A S L H S W L E H W Y S L E I L A P N N A K V Y T R M Q Q I A K R K Y G L L D L P D L
Capitella_sp K V K D L T S F L R . M R P I R F F D R N I N I K A H V F D R N I N I K A H V F D R N I D E T F Y N L T V A L H D W K T Y G E M R A L A H R K Y G L D L M E V H L
Lottia_gigantea G I K D L S H L K . I R P I R F F D R Y I N I R A L V E S Y L S K T F Y N L T T V A L H D W K T Y G E M R N M A Q Q Y G L N L V E P H L
Monosiga_brevicollis Q T K D L V H F L R . L N P L R F G D M L N I K R E V T H Y L D R T F Y N L T T V S L S L W A N Y A K M R S V A A I Y K G L D M Q T H L
Dictyostelium_discoideum G I K E F G K F L E . L K P L R F P D R T I D I K S R I S H Y L D Q T F Y N L N T V A L F D W K T Y S E M R N L A T Q R Y G L Q L E V H L

780 790 800 810 820 830 840
Mus_musculus F S Q T L E Q G L D V L E I M R N I H I F V S R Y L Y N L N N Q I F I E R T S N N K H L N T I N I R H I A N S I R T H G G I M N T V N F
Homo_sapiens F S Q T L E Q G L D V L E I M R N I H I F V S R Y L Y N L N N Q I F I E R T S N N K H L N T I N I R H I A N S I R T H G G I M N T V N F
Xenopus_tropicalis F S Q T L E Q G L D V L E I M R N I H I F V S R Y L Y N L N N Q I F I E R T S N N K H L N T I N I R H I A N S I R T H G G I M S T V S K
Danio_riero F S Q T L E Q G L D V L E I M R N I H I F V S R Y L Y N L N N Q I F I E R T S N N K H L N T I N I R H I A N S I R T H G G I M N T V N F
Drosophila_melanogaster F N Q I I D Q G I D V L Q I M R N I H T F A S S Y A Y N M L Q V F V E T N S R S K H L D I G T R H V A N S V Q T H G G I N T V N F
Caenorhabditis_elegans P O S I D E T V A I M D L Q N P T H F V T N Y Q Y F S Q Y L F I E K A S D S K L H V I R L E D F K T A L R K H G W G I L P T A I N A
Capitella_sp F S Q T L E Q G L D V L E I M R N I H I F V S K Y L Y N L N N Q I F V E R S S N N K H L N T I N I R H I A N S I R T H G G I M N T V N F
Lottia_gigantea F S Q T L E Q G L D V L E I M R N I H I F V S K L Y N L N N Q I F I E K T S N N K H L N T I N I R H I A N S I R T H G G I M N T I N F
Monosiga_brevicollis F S Q T L E Q G L D V L E I M R N I H I F V S R Y N Y N L N N Q I F V Q K S S P N K H L N T I N I Q H I A N S I R T H G G I M N T V N F
Dictyostelium_discoideum F E S T L E Q G L D V L E I M R N I H I F V S R Y N Y N L N N Q I F I Q R S S N S K H L N T I N I T H I A N S I R T H G G I M N T I N F

850 860 870 880 890
Mus_musculus T Y Q F L . K K K F Y I F S Q F M Y D E H I K S R L I K D I R F F R E I K D Q N . . D H K . Y P F D R A E K F N R G I R K L
Homo_sapiens T Y Q F L . K K K F Y I F S Q F M Y D E H I K S R L I K D I R F F R E I K D Q N . . D H K . Y P F D R A E K F N R G I R K L
Xenopus_tropicalis G S Y W L G R E R L K G A Q V P L M S N A S Q A L R T I L K D I R F P H A I W N O N S R Y K . . Y P F E R A E K F N R G I R K L
Danio_riero T Y Q F L . R K K F Y I F S Q F M Y D E H I K S R L I K D I R F F R E T K D Q T . . D Q K . Y P F E R A E K F N R G I R K L
Drosophila_melanogaster I Y Q F L . R Q K F Y T F S T F L H D E Q I K S R L K L E L R F H T E H K H S . . S Y Q S . Y P Y E R A S V L F K K I R R L
Caenorhabditis_elegans A Y Q F I . R N K I Q T F L S F L S E T V R C Q V L K L H E M E A N K S S P D G K K S Q Y K A S W A N F L K N L A R H Q M V G A Q G
Capitella_sp T F Q F L . R K K F F T F S Q F M Y D E H I K S R L I K D W R F F K E N H L Q T . . D Q K . Y P F D R A D K F N R G I R K L
Lottia_gigantea T Y Q F L . R K K F Y I F S Q F M Y D D H I K S R L I K D W K F F R E N H M Q T . . D Q K . Y P F E R A D K F N R G I R K L
Monosiga_brevicollis T Y Q F L . R K R F F T F S Q F L F D D H I K S R L L K D C R F F R E N R D E L . . D Q K . Y P F E R A E K F N R G I R K L
Dictyostelium_discoideum A Y R F L . V Q K F S I F S E F L F D D Q I K S K L Y K N I K Y F R E N K E Q L . . N N M . Y P S E L V T E L E R D I R Q L

900 910 920 930 940
Mus_musculus G I T P E G Q S Y L D Q F R Q L I S Q T G N A M G Y I R M I R S G G L H C S S N A I R F V
Homo_sapiens G I T P E G Q S Y L D Q F R Q L I S Q T G N A M G Y V R M I R S G G L H C S S N A I R F V
Xenopus_tropicalis G L T P D G Q S Y L D Q F R Q L I S H I G N A M G Y V R M I R S G G L H C C S N A I R F V
Danio_riero G L T P D G Q S Y L D Q F R Q L I S Q T G N A M G Y V R M I R S G G L H C C S A I R F V
Drosophila_melanogaster C C S S N G E T Y M D L F R K V I T Q V G N A V G Y V R L L Q A G S K N A N F R N R S Y K
Caenorhabditis_elegans A H V G G S T N G S A T A S A A A A N E M L Y T Y F D K F R L I I T Q T G N A I S L V R M L C Q A A R E N G L T R Q D L F P Q V K K Y I
Capitella_sp G L T P D G S S Y L D Q F R L I G Q T G N A M G Y I R M I R S G G L H C S S N A I R F V
Lottia_gigantea G M T P D G S S Y L D Q F R T L I S Q T G N A M G Y I R M I R S G G L H C C S N A I R F V
Monosiga_brevicollis G V K A D G R T Y L D R F R E L I T E I T G N M A Y I R M I R S G G L N M C S N S I R F L
Dictyostelium_discoideum G V S E T G L T F L D H F R L I T H I G N A M G Y I R L V R S G G L H Y C S N A T K F V

950 960 970 980 990 1000
Mus_musculus P D L E D I V S F E E L V K E E G L A E . E T L R A A R H L D S V L S D H T R N S A E G T E Y F K M L V D V F A P F E R R P K N I
Homo_sapiens P D L E D I V N F E E L V K E E G L A E . E T L K A A R Q L D S V L S D L T R N S A E G T E Y F K M L V D V F A P F E R R P K N I
Xenopus_tropicalis P D L E D I V N F E E L V K E E G L S E . E T Q A A R Q L D S V L S D L T S N S A E G T E Y F K M L V G V F A P F E R S A K N I
Danio_riero P D L E D I V N F E E L V K E E G L S E . E T Q R A S S Q L D C V L S D L T S N S A E G T E Y F K M L V G V F A P F E R S I K N M
Drosophila_melanogaster T R F D S N F S C G S K V H E . A T E G S I R E Y E K S L G H M K E C Y S D S T N Y F K L L L Q E F Q P F L C N P H N H
Caenorhabditis_elegans D L L E S N T R S L I F T N R P D C P I N S T K M H A A Y L G L V K E M F E R V A E H R N Y F K M M C V F E K S L L M R S K L P E D R V Q
Capitella_sp P D L E D I I A F E E L C K E D G L S T . E C Q K A A R Q L E D I I S N L S K N F A B G T E Y F K M L V D V F S P F E R D A K N M
Lottia_gigantea P D L D D I I S F E E L C T E A G E S P . E C T S A A K N L D M V I N N L A K N F A B G T D Y F K M L V D V F S P F E R N P K N M
Monosiga_brevicollis P D V T D V S F V E M L E A G A P E D . E T L Q A A R N L D A V V N D L V Q R F A E G S D Y F K M L V D V F A K E F R A D K N A
Dictyostelium_discoideum P D L K K I P K F Q D L T S K D A L S P . E T T Q A S T N L D A V I H N L S N N L S E G T E Y F K M L V N V F A T F E R N I A N Q

	1010	1020	1030	1040	1050	1060	1070
Mus_musculus	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Homo_sapiens	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Xenopus_tropicalis	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Danio_rerio	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Drosophila_melanogaster	HLDY	FHGI	IPAL	TLN	FVEHS	ISCKE	KLNNK
Caenorhabditis_elegans	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Capitella_sp	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Lottia_gigantea	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Monosiga_brevicollis	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA
Dictyostelium_discoideum	HLRN	FYITVPP	FLN	FVEHS	ISCKE	KLNNK	KLGA

	1080	1090	1100	1110	1120
Mus_musculus	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Homo_sapiens	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Xenopus_tropicalis	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Danio_rerio	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Drosophila_melanogaster	TITQHLNAERS	KVRDILAGQ	QRTAPEQL	DEKLHQTVA	ITERHVNAYE
Caenorhabditis_elegans	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Capitella_sp	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Lottia_gigantea	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Monosiga_brevicollis	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL
Dictyostelium_discoideum	SVREKYLKEIRAV	AKQQNVQSTS	QDEKLLQTMNLT	QKRLEVYL	QEFEL

	1130	1140	1150	1160	1170
Mus_musculus	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGPES	TVSADPVVK	
Homo_sapiens	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Xenopus_tropicalis	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Danio_rerio	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Drosophila_melanogaster	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Caenorhabditis_elegans	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Capitella_sp	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Lottia_gigantea	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Monosiga_brevicollis	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	
Dictyostelium_discoideum	LYFSLSSARIFFRADKTA	AEEENQEKKEKEE	ETKTSNGDGLSDS	TVSADPVVK	

Mus_musculus	.....
Homo_sapiens	.....
Xenopus_tropicalis	.....
Danio_rerio	.....
Drosophila_melanogaster	.....
Caenorhabditis_elegans	.....
Capitella_sp	.....
Lottia_gigantea	GSSVGA
Monosiga_brevicollis	.....
Dictyostelium_discoideum	.....

Supplementary figure 4. Alignment of KIAA1033 orthologs.

Sequences were aligned using MUSCLE (<http://www.drive5.com/muscle/>), and the alignment was rendered using ESPript (<http://esprict.ibcp.fr/ESPript/ESPript/>).

	1	10	20	30	40	50	60
Mus_musculus	.MLDFLA	ENNL	CGQA	ILRIVS	CGNAT	IAEVLRL	SEFIP
Homo_sapiens	.MLDFLA	ENNL	CGQA	ILRIVS	CGNAT	IAEVLRL	SEFIP
Xenopus_tropicalis	.MVDFLA	ENNL	CGQA	ILRIVS	CGNAT	IAEVLRL	SEFIP
Danio_riero	.MVDFLA	ENNL	CGQA	ILRIVS	CGNAT	IAEVLRL	SEFIP
Drosophila_melanogaster	..MSFLD	DNNA	CQGN	LLNIVS	VGNST	IABTLRL	KDVYPS
Caenorhabditis_elegans	.....M	TEENI	FLSKL	LHGES	TALAEI	RRLSS	SPFKDF
Capitella_sp	.MVDFLA	ENNL	CQGN	TLRIVS	RGNAT	IAEVLRL	ADFP
Lottia_gigantea	.MADFLA	ENNL	CQGN	ILRIVS	RGNAT	IAEVLRL	ADFP
Monosiga_brevicollis	.MATLLD	EKNQ	CQGN	LLRMTS	RGNAT	IAEVLRL	ADNVP
Dictyostelium_discoideum	MVKEFLG	EGSQA	CQGN	LLRIVS	RGNAT	IAEVLRL	SAHIF

	70	80	90	100	110	120	130
Mus_musculus	S	KLEAKPE	LQDLD	EEFREN	NI	IVTRFY	LAFC
Homo_sapiens	S	KLDAKPE	LQDLD	EEFREN	NI	IVTRFY	LAFC
Xenopus_tropicalis	G	RLEAKPE	LQDLD	EEFREN	NI	IVTRFY	LAFC
Danio_riero	G	RLEAKPE	LQDLD	EEFREN	NI	IVTRFY	LAFC
Drosophila_melanogaster	R	RIEQSP	LELTD	DEARQ	L	PLIVTR	FYLAFC
Caenorhabditis_elegans	K	ELSHLR	LQ...	TFYAS	T	QPLVTR	FYLAFC
Capitella_sp	N	RIIQKAG	LEDDL	EEFKEN	NI	IVTRFY	LAFC
Lottia_gigantea	H	RIESRVE	LQDLD	EEFSNH	NI	IVTRFY	LAFC
Monosiga_brevicollis	N	KIDTNP	LQDLD	EEQLRAS	Y	MPVTRF	YNAFC
Dictyostelium_discoideum	S	KIEENAD	LVDLE	TEFRDN	H	ITLIVR	FYHIF

	140	150	160	170	180	190	200
Mus_musculus	L	CEALYLY	GVMLL	VIDQ	KE	GEV	RRMLV
Homo_sapiens	L	CEALYLY	GVMLL	VIDQ	KE	GEV	RRMLV
Xenopus_tropicalis	L	CEALYLY	GVMLL	VIDQ	KE	GEV	RRMLV
Danio_riero	L	CEALYLY	GVMLL	VIDQ	KE	GEV	RRMLV
Drosophila_melanogaster	L	CEALYLY	GVMLL	VIDQ	KE	GEV	RRMLV
Caenorhabditis_elegans	E	AYCLYIS	GILII	YMDT	YI	APIR	ERII
Capitella_sp	M	SFALPI	YGVML	TVDM	TKT	ED	TRKML
Lottia_gigantea	M	CEALYLY	GVMLL	VIDQ	KE	GEV	RRMLV
Monosiga_brevicollis	M	EMLYLY	GCMML	LLVD	MR	IF	GLVR
Dictyostelium_discoideum	L	SEAVYLY	GVMLL	IMD	N	LIF	GEV

	210	220	230	240	250
Mus_musculus	.....P	P	NYP	ESYF	ORV
Homo_sapiens	.....P	P	NYP	ESYF	ORV
Xenopus_tropicalis	.....P	P	NYP	ESYF	ORV
Danio_riero	.....P	P	NYP	ESYF	ORV
Drosophila_melanogaster	G	LGGKQ	AGARA	ASLV	VPRYP
Caenorhabditis_elegans	.....P	P	NYP	ESYF	ORV
Capitella_sp	.....P	P	NYP	ESYF	ORV
Lottia_gigantea	.....P	P	NYP	ESYF	ORV
Monosiga_brevicollis	.....P	P	NYP	ESYF	ORV
Dictyostelium_discoideum	.....P	P	NYP	ESYF	ORV

	260	270	280	290	300	310	320
Mus_musculus	Y	VILYF	EP	SIL	HT	HQAK	MR
Homo_sapiens	Y	VILYF	EP	SIL	HT	HQAK	MR
Xenopus_tropicalis	Y	VILYF	EP	SIL	HT	HQAK	MR
Danio_riero	Y	VILYF	EP	SIL	HT	HQAK	MR
Drosophila_melanogaster	Y	VCLYF	EP	SIL	HT	HQAK	MR
Caenorhabditis_elegans	Y	VILYF	EP	SIL	HT	HQAK	MR
Capitella_sp	Y	VILYF	EP	SIL	HT	HQAK	MR
Lottia_gigantea	Y	VILYF	EP	SIL	HT	HQAK	MR
Monosiga_brevicollis	Y	VILYF	EP	SIL	HT	HQAK	MR
Dictyostelium_discoideum	Y	VILYF	EP	SIL	HT	HQAK	MR

	330	340	350	360	370	380	390
Mus_musculus	R	YASV	SDRV	RAQV	QQF	LKE	G
Homo_sapiens	R	YATV	SERV	HAQV	QQF	LKE	G
Xenopus_tropicalis	R	YAKI	IESL	HPQV	QQF	LKE	G
Danio_riero	R	YAAV	SVTL	LRPQ	VQQF	LKE	G
Drosophila_melanogaster	Q	KKEQL	GK	ITQ	KTQ	EV	IR
Caenorhabditis_elegans	K	HKKMM	NETS	..FPQ	INE	.....M	IDE
Capitella_sp	R	YAAK	CKQL	PLM	LSQY	LKE	G
Lottia_gigantea	R	YAAK	CKQL	PLM	LSQY	LKE	G
Monosiga_brevicollis	R	YAL	EAL	PKL	TKQ	AGL	L
Dictyostelium_discoideum	R	FWK	EV	SEL	NKL	VDDL	L

	400	410	420	430	440	450	460
Mus_musculus	R	QIKD	QIL	TDSRY	N	PKI	L
Homo_sapiens	R	QIKD	QIL	TDSRY	N	PKI	L
Xenopus_tropicalis	R	QIKD	QIL	TDSRY	N	PKI	L
Danio_riero	R	QIKD	QIL	TDSRY	N	PKI	L
Drosophila_melanogaster	G	QVQK	V	HELQ	P	N	R
Caenorhabditis_elegans	R	PLN	KY	R	L	P	..S
Capitella_sp	K	M	L	R	E	Q	V
Lottia_gigantea	K	L	I	R	D	O	V
Monosiga_brevicollis	Q	A	A	R	E	E	I
Dictyostelium_discoideum	K	K	F	K	D	L	V

	470	480	490	500	510	520	530
Mus_musculus	P	L	T	R	V	E	K
Homo_sapiens	P	L	T	R	V	E	K
Xenopus_tropicalis	P	L	T	R	V	E	K
Danio_riero	P	L	T	R	V	E	K
Drosophila_melanogaster	P	L	S	K	I	E	Q
Caenorhabditis_elegans	K	M	G	E	S	O	K
Capitella_sp	P	L	T	R	V	E	K
Lottia_gigantea	P	L	T	R	V	E	K
Monosiga_brevicollis	P	L	T	R	V	E	K
Dictyostelium_discoideum	A	L	T	R	V	K	N

540 550 560 570 580 590 600

Mus_musculus H QMIRTNIKEEVLITVQ IIG DLSFAWQLI D. SFTS IQES IRVNP SMVTK LRA TFLK LSA LD LPLLR I

Homo_sapiens H QMIRTNIKEEVLITM Q IVG DLSFAWQLI D. SFTS IQES IRVNP SMVTK LRA TFLK LSA LD LPLLR I

Xenopus_tropicalis H QMIRTNIKEEVLITM Q IVG DLSYAWQLI D. SFTS IQES IRANP SMVTK LRA TFLK LSA LD LPLLR I

Danio_riero H QMIRTNIKEEVLITM Q IVG DLSYAWQLI D. SFTS IQES IRANP SMVTK LRA TFLK LSA LD LPLLR I

Drosophila_melanogaster N QMAQLNLKEDI IHI MIT DFSYAWHL LQF DFT PPMQEH I KRQ PQA VIG ITRAVFLK LAST LE VPLMR I

Caenorhabditis_elegans R ALMSVLSLSDSMI PEV YSKM ESTYLWPL IS. QLI PRI QONL VSTNT DV. VRQ IFTKLS IS CYMLK LKL

Capitella_sp H QMIRVINVKEEVLIT I EIVADLAWH IVD. SYTPC MQSG I KRDP TLT VQ LRA TFLK LSA LD LPLLR I

Lottia_gigantea H QMLRTNIKEEVLIT EIVADLSYAWH IVD. SYTGYM QQG I KKD PSLVI K LRA TFLK LSA LD LPLLR I

Monosiga_brevicollis Q MIRTINIKDFLSVI SDVA DLSYAWH IVD. NYTGYM QAG I KQD PTLVI K LRA TFLK LSA LD LPLLR I

Dictyostelium_discoideum T KMIKIVNIKEEVLV NLS VCA DMSYAWH IVD. NYVDQM QG I KSD PKCVL K LRA TFLK LSA LD LPLLR I

610 620 630 640 650 660

Mus_musculus N QANSPDLLS. VSQYYSSELVSVYR KVLQI IPE SMT SLLK IIT KLO THD I M EV TRLD K KLRDYAQLG

Homo_sapiens N QANSPDLLS. VSQYYSSELVSVYR KVLQI IPE SMT SLLK IIT KLO THD I I E V P TRLD K KLRDYAQLG

Xenopus_tropicalis N QANSPDLLS. VSQYYSSELVSVYR KVLQI IPE SMT SLLK IIT KLO THD I I E V P TRLD K KLRDYAQLG

Danio_riero N QVNSPDLLS. VSQYYSSELVAVYR KVLQI IPE SMT SLLK IIT KLO THD I I E V P TRLD K KLRDYAQLG

Drosophila_melanogaster N QARSDELVS. VSNYSSELANLRRV LQIVPE TMS I LAK IIT YLL N VIK E F P T K V E K R L K D Y A Q F V

Caenorhabditis_elegans S N F S K D H V A S R I A N T Y S Y A L E K N L K T V L Q S V P Q H L F G I M Y N V I M P G L K T F E . P Y I E K T E L R E L S E F V

Capitella_sp N QANSPDLLS. VSQYYSSELVAVYR KVLQI IPE T M F T L L A K I I T F L Q T M K I T E V P T R L E K D K M R D Y A Q L D

Lottia_gigantea N QAGSKDLMS. VSQYYSSELVSVYR KVLQI I P Q T M F S L L A S I T R L L N R I Q E V P T R L E K D K M K D F A Q L D

Monosiga_brevicollis H QADSPLDFS. VSQYYSSELVSVYR R V L Q I I P R S M E I L A K V I A I R T R Q L K E V P T R L E K D Q L K E Y A Q L D

Dictyostelium_discoideum A Q C S P D L I S . V S E Y Y S S E L V G V Y R K V L E I V P K Q M E I L I K Q I T N M Q T N N I Q E M P T K V E K E R L R D F A Q L D

670 680 690 700 710 720

Mus_musculus P RYEVAKLTHAISIFTEGLMMKKTIVG I I K V D P K Q L E D G I R K E L V K R V A F A L H R G L I F N

Homo_sapiens P RYEVAKLTHAISIFTEGLMMKKTIVG I I K V D P K Q L E D G I R K E L V K R V A F A L H R G L I F N

Xenopus_tropicalis A R Y E V A K L T H A I S I F T E G L M M K K T I V G I I K V D P K Q L E D G I R K E L V K R V A Y A L H K G L I F N

Danio_riero A R Y E V A K L T H A I S I F T E G L M M K K T I V G I I Q V D P K Q L E D G I R K E L V K R V A Y A L H K G L I F N

Drosophila_melanogaster E R A K V A Q L T N S I A V F T G L M M K K T I V G I I Q V D P K Q L E D G I R K E L V N H A N A Y N L G L I F T

Caenorhabditis_elegans T N S R L V E T T S L I A N T S M G S R M M T T R V G T E I N P K B L L E G M I R Q L Y K B I K M I G T T S

Capitella_sp R R Y E V A K L T H A I S V F T E G L M M K K T I V G I I K I D P K Q L E D G I R K E L V K Q V A L A T H N G L I F N

Lottia_gigantea E R Y Q V A K L T H S I S V F T E G L M M K K T I V G I I K I D P K R L L E D G I R K E L V Q V A Y A L H K G I M F N

Monosiga_brevicollis L R Y E I A E L T Y Q I S V F T E G L M M K K T I V G I I K I D P K Q L E D G I R R E L V T Q V A R A L D E V T F E

Dictyostelium_discoideum Q R Y D L A R A T H S V S V F T E G I L A M E T I V G I I E V D P K Q L E D G I R K E L V L Q I A L A M D K T L I F S G K P Y Q A P S N

730 740 750 760 770 780 790

Mus_musculus P . R A K . P S E L M . P K L K E L G A T M D G F H R S F E Y I Q D Y V S I Y G L K I W Q E E V S R I I N Y N V E Q E C N N F L R T K I Q D

Homo_sapiens P . R A K . P S E L M . P K L K E L G A T M D G F H R S F E Y I Q D Y V N I Y G L K I W Q E E V S R I I N Y N V E Q E C N N F L R T K I Q D

Xenopus_tropicalis S . R A K . P S E L L . P K L K D M A A T M D G F H R S F E Y I Q D Y V S I Y G L K I W Q E E V S R I V N Y N V E Q E C N N F L R T K I Q D

Danio_riero P . K A K . P S E L M . P K L K E M A A T M D G F Y R S F E Y I Q D Y V S I Y G L K I W Q E E V S R I I N Y N V E Q E C N S F L R T K I Q D

Drosophila_melanogaster P E K G K T P V Q L L Q Q K L Q A L A K T I E G Y R S F E Y I E D Y L R V Q G L R I L L E S Q R I I N Y N V E K E C N S F L R T K I Q D

Caenorhabditis_elegans A T S S I . E N L L K M C D N I E T M R C S F Y L C D Y M N L D G E H V S V A M D D F . S R I S E

Capitella_sp P . K A K . S E L S . S K L D T L G T M D G F H R S F E Y I Q D Y V S I Y G L K I W Q E E M S R I V N Y N V E Q E C N S F L R T K I Q D

Lottia_gigantea P . K A K . V S E L L . P K L A T L G E Q M D G F H R S F E Y I Q D Y V N I Y G L K I W Q E E I S R I I Y N V E Q E C N S F L R T K I Q D

Monosiga_brevicollis Q V K G K . M T D L H . E M L Q V R H R M L D G F H R S F E Y I Q D Y V D I Y G L R I W Q E E V S R I V N Y N V E Q E C N S F L R T K I Q D

Dictyostelium_discoideum K Q Q Q . E I T E L L . Q R L K E L S N L D G F H R S F E Y I Q D Y V N I Y G L K I W Q E E F S R I V N Y N V E Q E C N S F L K K V Y D

800 810 820 830 840 850

Mus_musculus W Q S M Y Q S T H I P I P K F A P V S I T F I G R L C R E I L R I T D P K M T C Y I D Q L N T W Y D V K T H Q E V T S

Homo_sapiens W Q S M Y Q S T H I P I P K F T P V S V T F I G R L C R E I L R I T D P K M T C H I D Q L N T W Y D M K T H Q E V T S

Xenopus_tropicalis W Q S M Y Q S T H I P I P K F P P V S M T F I G R L C R E I L R I T D P K V T C Y I D Q M N T W Y D M K T H Q E V T N

Danio_riero W Q S V H Q S T H I P I P K Y P S V S A T F I G R L C R E I L R I T D P K V T C Y I D Q L N T W Y D L R T H Q E V T N

Drosophila_melanogaster F Q S E H Q S Q I I P I P N F P P L L G D P S N N F I G R L A H E I L R C T D P K Q T I F L D L K S T W Y E K A P H Q E V L A G

Caenorhabditis_elegans E R A F A R S S G E L S K N Y I A E L F I K T N P K A S R F S E S L S W K D V K M S K T V L S

Capitella_sp W Q S V Y Q S T A I P I P R F T P L S V N F I G R I S K E I L R I T D P R T T T F I D R A S A W Y D G R T K E B I I N

Lottia_gigantea W Q S V Y Q S T A I P I P R F P P V S V N F I G R L A R E I L R I T D S R T T I F I D M K A W Y D V K T K Q E V A N

Monosiga_brevicollis E E S I Y Q S R A I P I P R F Q P R M S M N F V G R L A R E L L R L T N P S T T L Y L E R N T T W Y D I K T K S B I V H

Dictyostelium_discoideum W Q S Q Y Q S V A I P I P K F P S Q S D Q N S Q Q S V N M I G R L A R E L L N Q T N C K T T L Y L N Q I G W F P S S G K E L V G

860 870 880 890 900 910 920

Mus_musculus S R L F S E I Q T T L G T F G L N G L D R L L C F M I V K E L Q N F L S M F Q K I I L K E R T V Q E T L K M M S A V N P L K S I V

Homo_sapiens S R L F S E I Q T T L G T F G L N G L D R L L C F M I V K E L Q N F L S M F Q K I I L R D R T V Q E T L K T L M N A V S P L K S I V

Xenopus_tropicalis N H L F S E I N D S L G T F G L N G L D R L L C F M I V K E L Q N F I R L Y Q R S I L R D K S G Q E T L R A L Q K V T P V K G I V

Danio_riero N R L F S E I Q D T L G T F G L N G L D R L L C F M I V K E L Q N F L T V L Q K S I L K D K A V Y D V F K A L L T A V N P V K G I V

Drosophila_melanogaster S G F F E I L R E A L A P A G M V G L E R L Y A H M L A D E K R N L R L Q R N L T S D R M W V D T L A A L T R E L E A R D F P T P E V S

Caenorhabditis_elegans F D V F D R I E K I V P F H I L T S E T H I V T L E K M L E Y I S N A R K I G V S F N Q S N T H E S A F Q

Capitella_sp I K V F S K L E K S V G S L G S G L D R L L C F M I V Q D Q D F G V M L S K T L F A D K T V E F F S K F G R D L Q P T S G L I

Lottia_gigantea R T L F Q Q I H R A V G S F G L S G L D R L L C F M I V K E L Q R F Q L N L Q R G V I R D K S W L E F F S L T T K L Q P L Q G T V

Monosiga_brevicollis A D T F Q R L L E A L D T F G L A G L D K L C F M I V H E L Q R F E R T W Q R Q L K Q I V P A L K S L S T T L Q P L A A P P

Dictyostelium_discoideum I N T W S I L H Q S V G I F G L T G L D K L F S P M M V K D L Q V F V S Q T R S L V E K S L G K F L N E F E D Y L R P T N I P

930 940 950 960 970 980 990

Mus_musculus A N S S K V Y L S A I T T Q K I W S A Y L E A T M K V G Q M O I L R Q O T A N E L N S C R F D S R H L A A A L D N L N K A L L A D I E A

Homo_sapiens A N S N K I Y F S A I A K T Q K I W T A Y L E A T M K V G Q M O I L R Q O T A N E L N Y S C R F D S K H L A A A L E N L N K A L L A D I E A

Xenopus_tropicalis A N S A K I Y S A A I A K T Q K I W P A Y L D A I M K V G Q M O V L R Q O T A N E L N Y S C K F D S K H L A G A L E N F N E A I L A D I Q A

Danio_riero A N A S K V T N A A A K T Q K I W S P Y L E A T M K V G Q M O I L R Q O T A N E L N Y S C K F D S K H L A A L E N L N K S L L S D I E A

Drosophila_melanogaster K Q P L K Y Q A Y T Q R W L K V W P T L D W V L C I G Q R L L R E T A G E L S F S S K C D A K L E N T A D T L N K A L L L S L S L

Caenorhabditis_elegans F F T G P N Y E R L V K S I Q P Q S A A L A A T L A Q I G Y L I L R T I C N A K Q L A N R H K E D S I Q R D L I E M S I S M A R D

Capitella_sp S N P H K M X A Q A I S K A N K L W R P F L D V V L K V G M Q L L R R I T A A Q L K N S S K F P S K F A M S L Q I T F N S A L L T I E R

Lottia_gigantea N Q P Q K V Y S Q A V S K T V K L W P V Y L D V I L R V G M Q L L R R O T A Y E L N T S C K F D S K F L A S S L Q T V N R A L L A D I E K

Monosiga_brevicollis A T T A . V Y A T G I Q Q L S K V F F I A N V V F K V G H I Q L L R R M I T A Q L N S A A K F D G K L L L A S V S K V N Q A L L A B I E T

Dictyostelium_discoideum D T M I R . Y Q A L D K T K L L Y P I F I D V L T K I G Q I Q L I R R O T S N Q L N F H C K I D S N M L F S S L D I M N K S L L N D I E S

1000 1010 1020 1030 1040 1050 1060

Mus_musculus H Y R D P . S L P Y P K E D N T L L Y . E I T A Y L E A A G T H N P L N K I Y I T T K R L P Y P I V N F L F L I A Q L P K L Q Y N K N L G

Homo_sapiens H Y Q D P . S L P Y P K E D N T L L Y . E I T A Y L E A A G T H N P L N K I Y I T T K R L P Y P I V N F L F L I A Q L P K L Q Y N K N L G

Xenopus_tropicalis H Y Q D P . S L P C P R E D N T L L Y . E I T A Y L E A A G T H N P L N K I Y I T T K Q L S F P I V N F L F L V A Q L P K L Q Y N K N L G

Danio_riero H Y Q D P . S L P Y P K E D N T L L Y . E I T A Y L E A A G T H N P L N K I Y I T T K R L P Y P I V N F L F L I A Q L P K L Q Y N K N L G

Drosophila_melanogaster S K D L C D E K G V M L T . E I Q E T L L Y T G N F E P L E Q V F L I T K N T H N M A L F M F T P I A H L G R M Q H S T I D

Caenorhabditis_elegans P T D L P T E M G T I L K . L M M Q Y S L Y D P E R M I F R L K D E P S P L F I A L V O

Capitella_sp H Y Q D P . S L P Y P S D E N P L M F . E M T S Y L E S S G L N N P F S K I Y V T T K M M L Y F S I C C F L N F V I S Q L P K L S Y V K S G V

Lottia_gigantea H Y Q D P . T Q P Y P K E E N P L M Y . E L T A Y L E S S G H N P L D K I Y I T T M R V P F P L F N Y F L V L S Q L P K L V Y N K S V S

Monosiga_brevicollis H Y R D P . S K P F P G D T L L L P . E L S A Y S E A V G A D P L Q K I Y V T T K L D E I A S L L F P F L S Q L Q R F S F A R Q L

Dictyostelium_discoideum H F Q R P D S N P Y P S D D N T L L P . D L A O Y L D T A G N D P E T R I Y I T T S P L E Q P A C L L F P F L S Q L S R K F Q P N S K L N

	1070	1080	1090	1100	1110	1120										
Mus_musculus	.MVC	CRKPADPVD	WPP..LVL	GLLTLTKQ	FHSRYTEQ	FLALIGQ	FIRSTME	QC.....	TSQ	KMP	EMPA	DA				
Homo_sapiens	.MVC	CRKPTDPVD	WPP..LVL	GLLTLTKQ	FHSRYTEQ	FLALIGQ	FIRSTME	QC.....	TSQ	KIPE	IPAD	DV				
Xenopus_tropicalis	.MT	CRKPADPI	DWVP..LVL	GLLTLTKQ	FHSRYTEQ	FLALIGQ	FIRSTME	QC.....	TSQ	KIPE	MPAD	DV				
Danio_rerio	.MA	CRKPADAL	DWAP..LVL	GLLTLTKQ	FHSRYTEQ	FLALIGQ	FIRSTME	QC.....	TSQ	KIPD	MPS	DV				
Drosophila_melanogaster	CLL	PKSAKDN	INVP..FIV	GLVTLIQ	FHKNFKML	YISYMSQ	YVVTVSE	A.....	QLD	KEIL	GP	EV				
Caenorhabditis_elegans	CLL	PK.IGD	PYFVCPKQ	LEV	GIRFVLRQ	.....SR	LLPYFL	PIREQLF	.....	QSR	PKRV	DV		
Capitella_sp	ELL	PKASDHL	DMS..FV	VGAITLTKQ	FHSDNTDL	FLI	EYLA	YVRS	HME	SS	KPTELSG	DV			
Lottia_gigantea	SLV	SKKPEHL	DAPS..FT	IGVTLTKQ	FHADNTNF	FLA	FLGQ	YIRSC	VE	AM	SS	KSPELSQ	DV		
Monosiga_brevicollis	TLV	SRKQGD	DDV	GTV..FI	AGLITLTKQ	FHSHQLS	FQGMFA	CHVRA	QIQ	T	VD	PKSPTLSA	DA		
Dictyostelium_discoideum	VMS	SKKQKNS	YD	WTP..FI	IGCITLTKQ	FHSLHTQK	FL	AFVGQ	YLS	HIN	I	ALANPKE	NN	KDDADY	PE	DV

	1130	1140	1150																																				
Mus_musculus	V	GAL	LF	E	DYVRYTKLPRRVAEAHVNFIFDEFRTVL...																																		
Homo_sapiens	V	GAL	LF	E	DYVRYTKLPRRVAEAHVNFIFDEFRTVL...																																		
Xenopus_tropicalis	V	GAL	MF	E	DYVHFVAKLPRRVVEAHVNFIFDEFRTIQ...																																		
Danio_rerio	V	GAL	MF	E	DYVRYTKLPRKVAEAHVPSFIFDEFRTVL...																																		
Drosophila_melanogaster	V	TAL	H	F	LAFIRIARLPLGVLEQRIPNIILSEYEYLSLTLK																																		
Caenorhabditis_elegans	D	R	F	I	RHLISNL.....																																		
Capitella_sp	V	T	C	L	I	F	E	E	F	V	Q	F	S	G	I	S	R	K	I	V	E	A	H	I	P	T	Y	I	L	D	E	F	K	A	Q	A	F	Q
Lottia_gigantea	L	N	V	L	F	L	E	D	Y	I	F	Y	N	R	L	P	R	K	S	V	E	S	F	I	P	S	Y	I	F	D	E	F	R	S	Q	Y	A	
Monosiga_brevicollis	I	N	S	L	V	F	L	E	E	M	A	Q	Y	C	K	T	S	R	A	T	L	M	T	N	L	P	P	Y	I	V	D	E	F	R	R	Q	T	
Dictyostelium_discoideum	I	G	L	R	F	L	E	D	F	C	K	Y	S	H	T	S	R	K	I	V	E	G	Y	V	P	P	Y	I	F	D	Y	Y	N					

Supplementary figure 5. Alignment of Strumpellin orthologs.

Sequences were aligned using MUSCLE (<http://www.drive5.com/muscle/>), and the alignment was rendered using ESPript (<http://esprict.ibcp.fr/ESPrict/ESPrict/>).

	1	10	20	30	40	50	60	70
Mus_musculus	MTPVK	TQCSLAGLI	YAVPLIQPDLR	REEAVIQVADAOYIQN	ISGDIFSRISRV	ELSRRLQAI	ISEFRVS	
Homo_sapiens	MTPVR	MQHSLAGQT	YAVPLIQPDLR	REEAVIQVADAOYIQN	ISGDIFSRISRV	ELSRRLQAI	ISEFRVS	
Xenopus_tropicalis	...MPQ	NRSMESQAT	YSLPLIQPDLR	REEAVIQVADAOYIQN	ISGDIFSRISRV	ELSRRLQAI	ISEFRVS	
Danio_riero	MVRMT	QKRYLEGQV	YSVPLIQPDLR	REEAVIQVADAOYIQN	ISGDIFSRISRV	ELSRRLQAI	ISEFRVS	
Drosophila_melanogaster	...MEES	SPYLHSP	YQVATIQPDLR	REEAVIQVADAOYIQN	ISGDIFSRISRV	ELSRRLQAI	ISEFRVS	
Caenorhabditis_elegans	...YHVP	LIQRD	AGREETIFRIN	QSTQKLLRV	SDIFDRVEHR	ITR	IHGKABADR	RTTE
Capitella_sp	...MKIN	DMSDKP	YNVAVMPPDLR	REEETIKQICD	AGYLDQITL	LDIFARVS	QRITD	NHSLKAVNDR
Lottia_gigantea	...YHVP	LIQRD	AGREETIFRIN	QSTQKLLRV	SDIFDRVEHR	ITR	IHGKABADR	RTTE
Monosiga_brevicollis	...CVYH	VVPAHL	REEESLQMLD	ADAEYLSA	TVDDIF	GKITTS	VNAN	KERLVAVN
Dictyostelium_discoideum	...MTTQ	IYQVPLV	SNGLR	ETESI	LQIVDS	EKLEKVF	NDMYS	TISARV

	80	90	100	110	120	130
Mus_musculus	LAQAKIEKIKGSK	KAIKVFSS	AKYPA	PEHLQEYGS	SIF	TGALD...PGLQRRPRYR
Homo_sapiens	LAQAKIEKIKGSK	KAIKVFSS	AKYPA	PERLQEYGS	SIF	TGAQD...PGLQRRSRHR
Xenopus_tropicalis	LAQAKIERLKGIK	KAIKVFSS	AKYPA	PERLQEYGS	SVF	AGAED...GWLAKKLRHK
Danio_riero	LAQARVKIKGSK	KAIKVFSS	AKYPA	PEHLQDYS	SIF	TGAVD...PASQRRPRIK
Drosophila_melanogaster	RAQAKIDALVGS	KRAIITFAP	ARLP	SDVLAPLP	ATF	PQVAANPLMEQ
Caenorhabditis_elegans	VLEKLES	SLQESDKVITFL	RLPQLPK	LPEEPTST	SLF	RINIDTEHPG
Capitella_sp	LAAAKISLKGSK	KATKVFSS	AKYPA	DADGIPFM	SVY	QDVDEK...LKKVQHSYK
Lottia_gigantea	LAAAKISLKGSK	KATKVFSS	AKYPA	DADGIPFM	SVY	QDVDEK...LKKVQHSYK
Monosiga_brevicollis	TANA	KVQKIVGTR	RATTVFCS	AKYPA	DDKLDYPO	ALFQESHG...PGFVE...HS
Dictyostelium_discoideum	NAQ	HKVNQIVGSK	QAIVT	FSSAKYPA	DKKWGDYV	PTYS

	140	150	160	170	180
Mus_musculus	ALQEK...KYF	FPVCVNT	KS...EPEDA	E...GLGGL	LPS.NT
Homo_sapiens	ALQEK...KYF	FPVCVNT	KS...EPEDA	E...GLGGL	LPS.NT
Xenopus_tropicalis	AVQEK...KYF	FPVCVNT	RG...EDESA	E...GLGGL	LPS.NT
Danio_riero	AQQEK...MYLP	FPVCVNT	KS...RSEDE	E...GLGGL	LPS.NT
Drosophila_melanogaster	PDDAD...FHH	VVRGDR	Q...ESPLVA	RKI	TNR
Caenorhabditis_elegans	DFTYE	NKPKDF	FLTSQV	LKE...YEQK	GWERY
Capitella_sp	VCQEK...QYV	NVQLKAKR	S	RKQ	KENDG
Lottia_gigantea	VFRDK...QYV	NVHLN	VKK...RARD	GNN	E
Monosiga_brevicollis	VDRDR...YNF	KSNTIR	RER	GAD	PEE
Dictyostelium_discoideum	PEDSY	LDVNDL	VIE	KSID	T...SKE

	190	200	210	220	230
Mus_musculus	KKYV...FLD	PLAGAVTK	HTMLG	TE...EEK	FDFA...PLS
Homo_sapiens	KKYV...FLD	PLAGAVTK	HTMLG	TE...EEK	FDFA...PLS
Xenopus_tropicalis	KKYV...FLD	PLAGAVTK	HTMLG	TE...EEK	FDFA...PLS
Danio_riero	KKYV...FLD	PLAGAVTK	HTMLG	TE...EEK	FDFA...PLS
Drosophila_melanogaster	GEDL	NARKRS	LPPONAR	VASQST	ITLGT...EKQ
Caenorhabditis_elegans	GDFS...KKA	LDAADD	GGTSRS	GRTT	DEL...AQLR
Capitella_sp	KKYV...MLD	PLGVT	KVRS	LDEE...DSG	LAE...PST
Lottia_gigantea	KKYV...MLD	PLGVT	KVRS	LDEE...DSG	LAE...PST
Monosiga_brevicollis	KKYT...LVD	PLRGT	VTRT	RDVDE...EQ	LAD...PKT
Dictyostelium_discoideum	KYS...NT	LDNL	SGD	GGDD	YITFGD

	240	250	260	270	280	290
Mus_musculus	VVDLGQVPEID	VPSYLPD	PLGAVAD	DLMSAD	LGPGIA	PSAPGA..IPB
Homo_sapiens	VVDLGQVPEID	VPSYLPD	PLGAVAD	DLMSAD	LGPGIA	PSAPGT..IPB
Xenopus_tropicalis	VVDLGQVPEID	VPSYLPD	PLGAVAD	DLMSAD	LGPGIA	PSAPGV..IPB
Danio_riero	VVDLGQVPEID	VPSYLPD	PLGAVAD	DLMSAD	LGPGIA	PSVPASNS
Drosophila_melanogaster	NPAAL	AAPAI	VLDL	PLGAVAD	DLMSAD	LGPGIA
Caenorhabditis_elegans	EKKKK	TAKMVE	MDSD	LPNPK	GHAHDF	TLRD...PEI
Capitella_sp	IPGL	GEVPEI	VPEF	LPDLAG	VADL	SYSD...MPL
Lottia_gigantea	MFDI	GEVPEI	VPEF	LPDLAG	VADL	SYSD...MPL
Monosiga_brevicollis	KFGM	AVPTI	DAPAF	LPDQ	GVAD	LAFVVE...NSASIA
Dictyostelium_discoideum	EGT	FIPVY	NPSIS	LP	LNVA	ENTWA...SQSIA

	300	310	320	330	340
Mus_musculus	LQPELENE...VLLA	APPPPP...P	PPPPP...P	APTALV	STPQPPMF
Homo_sapiens	LKADLQDG...VLLA	APPPPP...P	PPPPP...P	APVFLASA	SPLP
Xenopus_tropicalis	SRTDSQDG...RLLP	PPPPPP...P	PPPPP...P	PEPSVLS	PPPTSLAP
Danio_riero	SGSDSQF...KLEA	PPPPPP...P	PPPPP...P	THVPVPP	PPPTSAAP
Drosophila_melanogaster	QAI	AAQTHIP	GGVRRK	SVQC	PPSPTAA
Caenorhabditis_elegans	TEAEADAP...TTFL	PPPPPP...P	PPPPP...P	VEITE	IPPI
Capitella_sp	SGPADLGS...SSAP	PPPPPP...P	PPPPP...P	PADV	PPPPPP
Lottia_gigantea	SGPAEL	PGVVLD	VSGPPPP	PPPPPP	PPPPPP
Monosiga_brevicollis	DQTVT	QAAAPAS	APTSS	APPPPP	PPSGAA
Dictyostelium_discoideum	NNVNN	NNNNNN	NNSTG	TMQP	POPT

	350	360	370	380	390	400
Mus_musculus	SSSSMAHTASV	QGAPKE..VVD	PPSSG	RATL	LESIRQ	AGGIGK
Homo_sapiens	SSSSA..SPSV	QGAPRE..VVD	PPSSG	RATL	LESIRQ	AGGIGK
Xenopus_tropicalis	VGDP...GSLQ	GAPKE..VVN	PPSDG	RASL	LESIRQ	AGGIGK
Danio_riero	ASSPAPT	GTVKGAPSE..VVQ	PPSNG	RASL	LESIRN	AGGIGK
Drosophila_melanogaster	PLSP	LATPLN	MPQPPP...ATE	DRSE	LMAAIR	NAAGGV
Caenorhabditis_elegans	...SSSV	TFSPTK...SVD	GGRS	LMAAIR	NAAGG	AGKLS
Capitella_sp	...APQA	QPPKERA	ENPDAG	RSSL	LMAAIR	NAAGG
Lottia_gigantea	...SIQI	QDAPPE..VSAP	SDGR	RASL	LD	SI
Monosiga_brevicollis	...TLAV	DDVSD	GGGGG	GDARND	LASIRRN	...NKAN
Dictyostelium_discoideum	DDDDDD	NGG...GGG	GGGA	IGD	L	LAD

	410	420	430	440
Mus_musculus	.QKEQE...QVR	ATSG...GDI	MSDL	FNKLV
Homo_sapiens	.QKEQE...QVR	ATSG...GDI	MSDL	FNKLV
Xenopus_tropicalis	.MKEQE...QVR	ATSG...GDI	MSDL	FNKLV
Danio_riero	.QKEQE...QVQ	ATVSG...GDI	MSDL	FNKLV
Drosophila_melanogaster	...NSR	SKACG	AVTGD	MSDL
Caenorhabditis_elegans	...SSSV	TFSPTK...SVD	GGRS	LMAAIR
Capitella_sp	...APQA	QPPKERA	ENPDAG	RSSL
Lottia_gigantea	...SIQI	QDAPPE..VSAP	SDGR	RASL
Monosiga_brevicollis	...TLAV	DDVSD	GGGGG	GDARND
Dictyostelium_discoideum	DDDDDD	NGG...GGG	GGGA	IGD

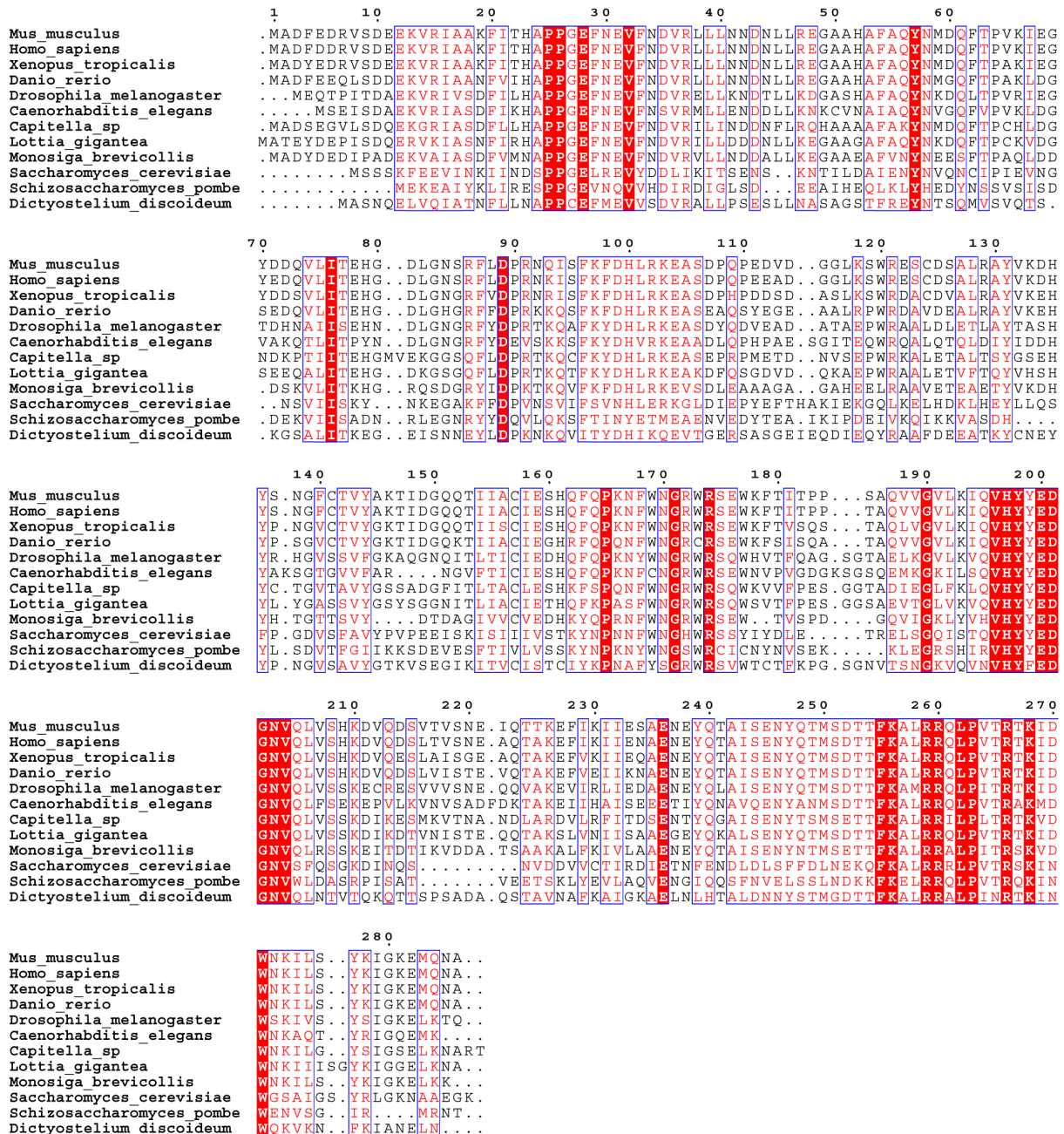
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                                450      460      470
Mus_musculus      .....GGAFSRMSDSIPPLPPPQ.....QPAGDEDEDWES
Homo_sapiens      .....GGAFARVSDSIPPLPPPQ.....QPQAEDEDDWES
Xenopus_tropicalis.....TGAFARISDTIPPLPPP.....QASGDGEDDWES
Danio_rerio       .....SSGSFARMSDVIPLPAPQ.....QSAAD.DEDDWEA
Drosophila_melanogaster.....MQQLSRVIPPVQPRKGSKSSDEHSEDDEGWN.
Caenorhabditis_elegans.....AKVSSTIPAPP.....NFDDEEWD.
Capitella_sp      .....SNPMDRISAMIPPPS.....RETSEAPDEEWEE
Lottia_gigantea   .....GGGSAMDKISSMIPAPPEPSE.....DASAGGDDDDWD.
Monosiga_brevicollis.....DEDDRPAAPPPLKTGNSMMDNLAAMIPQLPPGS.....DDDGGDDGDDWD.
Dictyostelium_discoideum.....DTDDQ.....DGESDTSSEWE.

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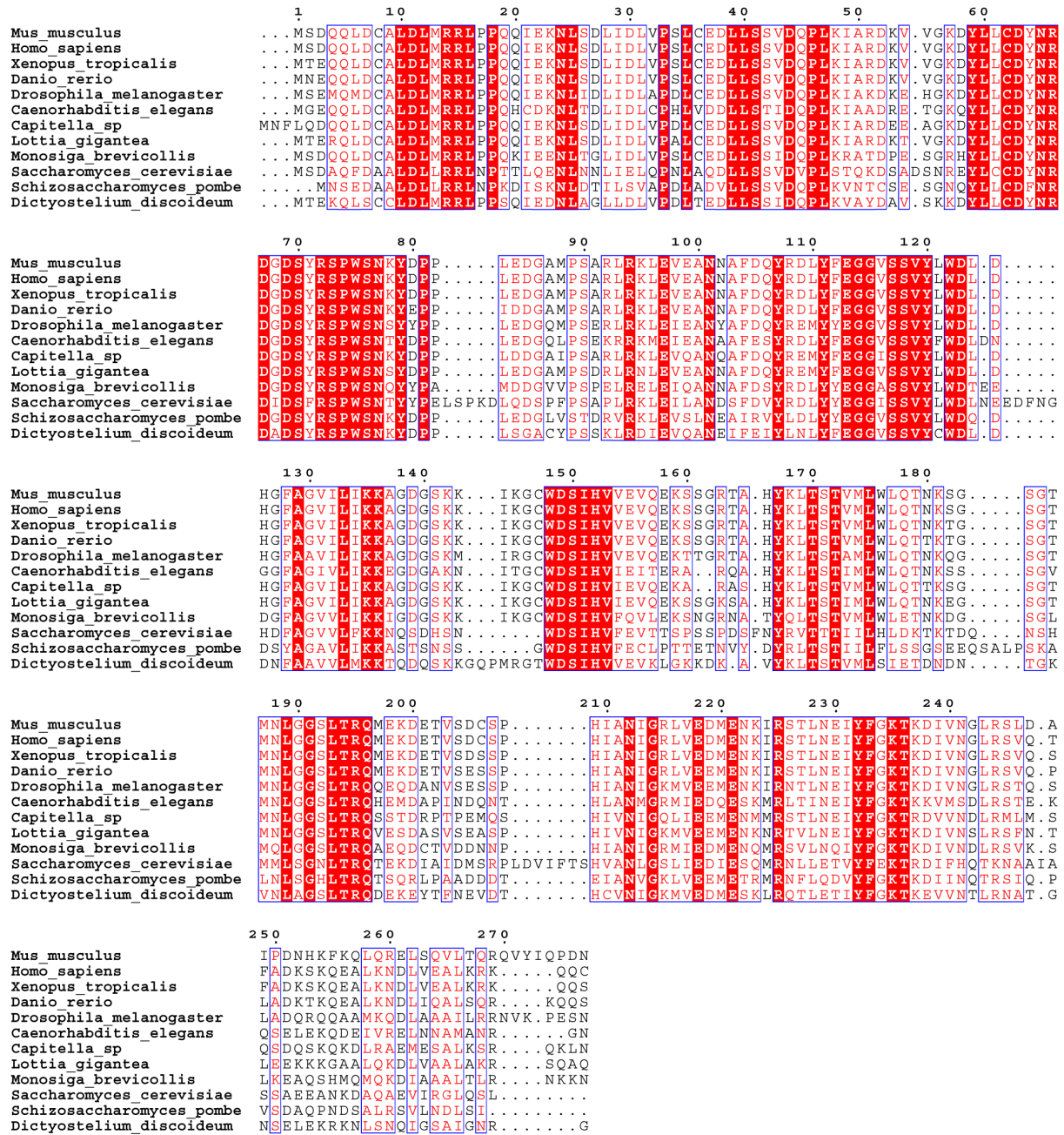
Supplementary figure 6. Alignment of WASH Orthologs.

Sequences were aligned using MUSCLE (<http://www.drive5.com/muscle/>), and the alignment was rendered using ESPript (<http://esprict.ibcp.fr/ESPript/ESPript/>).



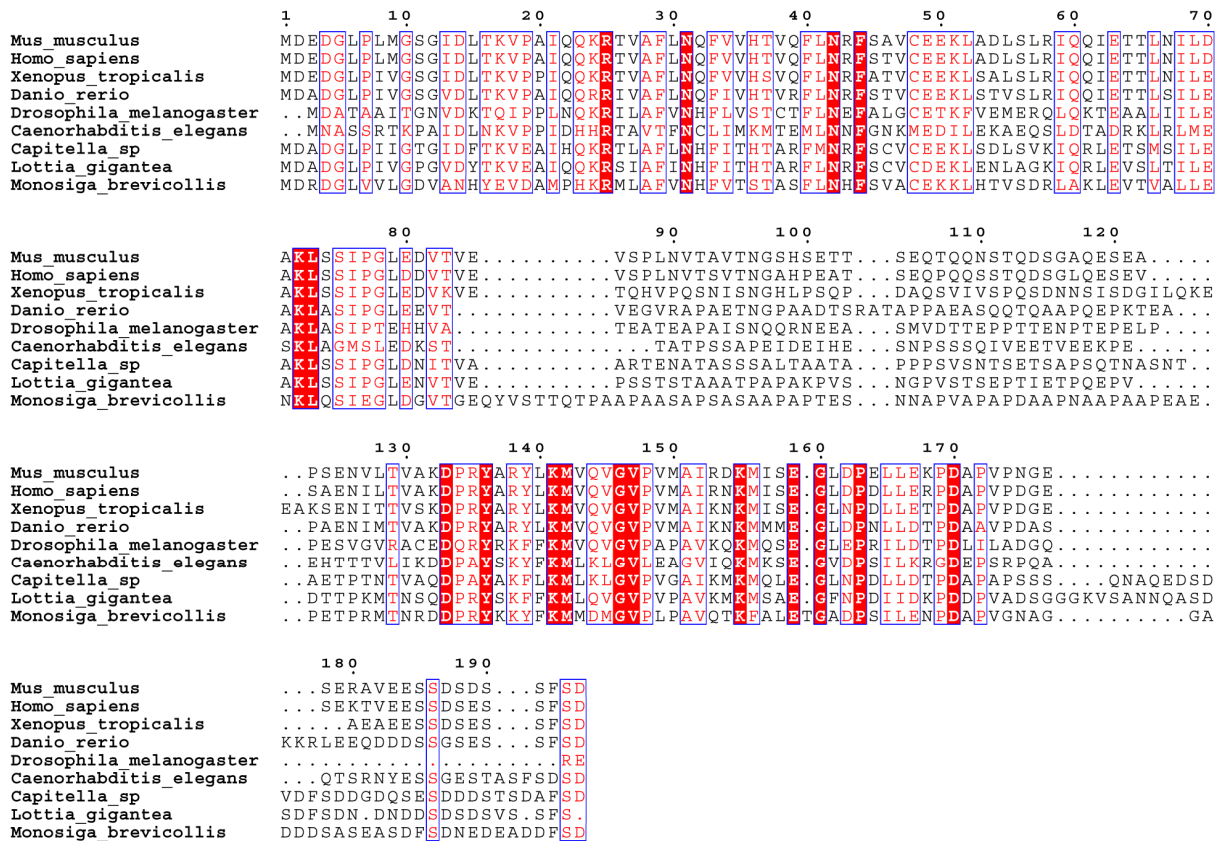
Supplementary figure 7. Alignment of CapZ α Orthologs.

Sequences were aligned using MUSCLE (<http://www.drive5.com/muscle/>), and the alignment was rendered using ESPrnt (<http://esprnt.ibcp.fr/ESPrnt/ESPrnt/>).



Supplementary figure 8. Alignment of CapZ β Orthologs.

Sequences were aligned using MUSCLE (<http://www.drive5.com/muscle/>), and the alignment was rendered using ESPrnt (<http://esprnt.ibcp.fr/ESPrnt/ESPrnt/>).



Supplementary Figure 9. Alignment of Ccdc53 Orthologs.

Sequences were aligned using MUSCLE (<http://www.drive5.com/muscle/>), and the alignment was rendered using ESPrnt (<http://esprnt.ibcp.fr/ESPrnt/ESPrnt/>).