

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

B. Percent Identity

SEQUENCE	%ID	SEQUENCE	% ID	SEQUENCE	% ID	SEQUENCE	% ID
HUMAN	100	PRIAPULA	39.13	MOSS	27.12	PARAMECIUM	19.2
TASDEVIL	76.74	TRICHOPLAX	38.96	TRICHINELLA	27.1		
PLATYPUS	75.07	APLYSIA	38.8	GLOBOSUM	27.06		
TURTLE	71.85	LIMULUS	37.87	SYNCEPHALASTRUM	26.81		
ALLIGATOR	70.16	CAPITELLA	37.3	LIGNANO	26.75		
OSTRICH	69.69	SPONGE	35.36	KLEBSORMIDIUM	26.73		
GECKO	68.51	SCORPION	34.13	CLUBMOSS	26.14		
CANARY	67.87	OCTOPUS	34.1	FLEA	25.89		
CAECILIAN	67.78	CIONA	33.31	BEETLE	25.84		
COELACANTH	65.37	SPIDER	32.97	AEDES	25.48		
STERLET	64.82	ROTIFER	32.76	AMPHIPOD	25.26		
XENOPUS	64.29	HYDRA	32.12	COPEPOD	25.25		
BSHARK	62.27	TICK	31.54	NEOCALLIMASTIX	25.24		
ESHARK	62.16	SALPINGOECA	30.31	WHITEFLY	24.71		
GAR	61.72	TERMITE	29.94	WHIPWORM	24.28		
DANIO	58.41	SHRIMP	29.87	STYLONCHIA	23.96		
LANCELET	43.55	MUDCRAB	29.6	MIDGE	23.95		
STARFISH	42.62	LOBOSPOR	29.33	BOMBUS	23.47		
SEA_ANEMONE	41.84	GLOMUS	29.2	STENTOR	23.47		
STONYCORAL	41.33	PVIOLACEUM	28.96	DAPHNIA	23.2		
SEACUKE	41.16	DPURPUREUM	28.57	APHANOMYCESa	22.71		
SEA_URCHIN	40.96	PALUSTRIS	28.15	APHANOMYCESe	22.62		
SCALLOP	40.12	HALBUM	28.03	ANT	22.07		
LINGULA	39.84	BARNACLE	27.77	BREMIA	21.61		
SOFTCORAL	39.82	TARDIGRADE	27.65	PLASMOPARA	21.49		
LIMPET	39.41	LIVERWORT	27.52	PYTHIUM	20.98		
OYSTER	39.36	FUNGIVORUM	27.18	TETRAHYMENA	20.77		
SNAIL	39.34	THRIP	27.15	OSTREOCOCCUS	20.07		

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

C. Clustal Omega Alignment All Phyla.

PARAMECIUM	-----MNV--LLEKELQKLAAGNYQ-----	18
TETRAHYMENA	-----MLEH--LLESALIKLYQGNFT-----	19
STYLONCHEIA	-----MEQ--KIDELLRQLHKFLFA-----	18
APHANOMYCESA	-----MSQKCHLLD--QVDRSLRQLYDIASSRD-----	26
APHANOMYCESE	-----MNDKSNRFX--ELDRALHQLYNIASSKD-----	26
PYTHIUM	-----MAEKVRDLR--ELTAYLES-----	18
PLASMOPARA	-----MTTKLNERLE--ELTAFLLH-----	18
BREMIA	-----MTKLSERLE--ELAAFLLH-----	17
ADESES	-----MF-----	2
MIDGE	-----MSDQDVVKRLEKLRQQLKN-----	20
BOMBUS	-----ME--SFKTFMDIFERAVT-----	16
ANT	-----MD--SYQTFIDIFKQAS-----	16
WHIPWORM	-----MVIQ--VLDELWKLQSLKTSADKGD-----	24
TRICHINELLA	-----MAYS--TVDRIRDALNSLKDFIEGAD-----	24
BEEBLE	-----MDL--SPRDFLKLKYLYDE--EAED-----	22
BARNACLE	-----MAVQ--EIQQLFRELOQSVVCR--EELH-----	23
THRIP	-----MDKDIESLWLCPLA--KE-----	16
FLEA	-----MAS--IVEDTFKDLKCIQT--KQGT-----	22
WHITEFLY	-----MA--EIDEILQDLSHIPSE--P-----	18
TICK	-----MSE--QIREAL--QRLNAS--DHLA-----	19
TERMITE	-----MMGS--ELIGFVEVINSICSG--NHLN-----	23
DAPIPIA	-----MEN--LLEDFLFQHSIATCS-----	18
OSTREOCOCCLUS	-----MA--DYRALCARADASGD-----	19
SPENTOR	-----MER--RVEELLNTHSLTF-----	17
KLEBSORIDIUM	-----MET--TLVFYLTTELREDAVK--RSLG-----	22
CLUBMOSS	-----MDS--KVSQYLATLNSEAEAA--LKG-----	22
MOSS	-----MDK--QLGSCLASLADADSRSVG-----	23
LIVERWORT	-----MDQ--KLVRCMTALKDEAAARMGA-----	23
LIGNANO	-----MSSD--DIRFVIDKFL--KDPE-----	18
COPEPOD	-----ME--RLEEDVGELECELLSHLESSPGDIQ-----	26
GLOBOSUM	-----MADDLITQLEQLSRP-----	15
PALUSTRIS	-----MASQ--AAVE--NLRRLVELNECVKSATITSTK-----	31
NEOCALLIMASTIX	-----MSTNIDI-----LRNLLNELSINRDK-----	23
GLOMUS	-----MS-----GLD--TLQKCLQELANCRQIVQKSSFG-----	28
LOBOSPOR	-----MNSQLDLRL--SLVELDEMGENPDVNSQ-----	30
SYNCEPHALASTRUM	-----MS-----VSV--SIEACLQDLSEALRISLSLK-----	25
FUNGIVORUM	-----MTKSPGSMRNPYI--SPSCDTP--MNGENHR--HLEILLAGI--PHLLGPNGETQGGKDVTD-----	56
HALBUM	-----MFKNMN--NVDSIYQ--RIDGYLVKLHQSIVGGTSTST--TTATT-----	38
DUPURPUREUM	-----MNSNNNSNN--NSP--INNNIYQ--RIENYLKFFQTI--TDNQSOS--IDTTN-----	45
PVIOLACEUM	-----MNNNSNSNSNE--QVTTKLN--VNNGIYQ--KLSNYLRKLYDVKF-----	43
AMPHIPOD	-----MATE--SHN--EVQILLDKLENLVYNDNDS-----	26
SHRIMP	-----MAGGGREE--ELDLLLLKQLQSPGPGQG-----	27
MUDCRAB	-----MAGGGRE--V--QDLLEKLLHHYSSGNELR-----	26
TARDIGRADE	-----MASR--QVLSAVEELSAIVSATP--SL-----	23
HYDRA	-----MSG--ELTRLEETIFLLRTKNS-----	20
SALPINGOBECA	-----MAAARS--ELERLCRNLEEQRLSASPR-----	25
SPIDER	-----MG--DFLDDLQSHLDALFKAQSD-----	22
LIMULUS	-----MTHCYG--RKYQLLSLOECLDINSQV-----	26
SCORPION	-----MNEITN--SLHENILKLNDFIKYQDEG-----	26
ROTIFFER	-----MN--DLEKHQNLFDLSLNSN-----	19
CIONA	-----MA--RLRECLTKLQSLDSD-----	19
OCTOPIUS	-----MAR--EI--KRIEQCLNDLWN-----	17
CAPITELLA	-----MAR--ALQEQLAGLVSDTRGQ--PGV-----	22
LIMPET	-----MAGS--LLEESLRLHANLKGQSQE-----	24
SCALLOP	-----MAAS--LLENNLRSLHKLKAGDASA-----	24
LINGULA	-----MAG--NLQDLCLTLHSCVGGEEEDA-----	23
OYSTER	-----MAAS--LLEDNLRSLNECLTTADNSS-----	24
SNAIL	-----MAA--TLEETLRLSHDQ--SGASA-----	20
SPONGE	-----MESRLESLEWELHSSP--Q-----	18
FRIPAPULA	-----MARTV--REEDHVQTLLESPODREA-----	25
DANIO	-----MAADTSTVG--GIQGYLLKHLHSLLEDVSTN-----	29
ESHARK	-----MAGPRGAAA--DTLSAFSKLHLLSLSDVKS-----	29
BHARK	-----M--ADGMRRHGAVGL--EVERRLQQLQLLSAQDSRS-----	34
XENOPUS	-----MLLAGAGGSSGDG--QDGVASGPAESAA--GILGRLHQLHGLLSL--ESGV-----	45
STERLET	-----MA--QPGSCSVGAG--GIQGNLHKLHSLFNATDAKS-----	32
GAR	-----MAGSGG--GIQGYLKLHSLCAGETKQ-----	26
HUMAN	-----MAGSGA--GVRCSLLRQETLSAADRCG-----	26
PLATYPUS	-----MAGSVP--GPQGSLLRQRFLEAEDAGV-----	26
TASDEVIL	-----MSGAGG--GLQGSLLQLQELLSGGDPGS-----	27
COELACANTH	-----MA--EEGSPSAVE--GVSGLLKHSSLTVDTKS-----	32
CAECILIAN	-----MS--VPGVGGDSAV--GVQGSLLRLHSLSSKDPGL-----	32
CANARY	-----MA--GVQQLLQLHRLCQPGDAGG-----	22
OSTRICH	-----MCS-----	3
GECKO	-----MAIS--LPVA--GG--GLQGLLQLHGTQSPDPAS-----	30
TURTLE	-----MAAA--LPVGG--GG--GIQGSLLHQLSCALQDPDPT-----	31
ALLIGATOR	-----	0
APLYSIA	-----MAA--NVANFLQSLHDFIDASI--SS-----	22
TRICHOPLAX	-----MAS--NLSQLLIDLHALLNLQS--LH-----	22
SOFTCORAL	-----MTE--VIDRYLNQLNSCLKTLSSSR-----	23
STONYCORAL	-----MSD--LLNRYLTHLHSLPDL--DAPH-----	22
SEA ANEMONE	-----MTD--AISSRLQLNELVAESPLR-----	23
SEACUKE	-----MAVP--QISAKLSDLYELLKSSRDTP-----	24
LANCELET	-----MAGSG--SLEARLSELHALLAESDGH-----	25
STARFISH	-----MATA--DLPVKLSELNGLISTKSLH-----	24
SEA URCHIN	-----MAAA--ELQRHLAELHEVIDSGGTAH-----	24

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----RASDIKDS---IEN---ILFENQL--NH----	38
TETRAHYMENA	-----DSKIVQA---ISD---ILLDETL--DD----	39
STYLNCHIA	-----DSEQVNE---LRI---YILDESL--KE----	38
APHANOMYCESa	-----VEVDKDTIESFVAALFRRSVRCLES-----	52
APHANOMYCESe	-----VEVDKDTIESAVTTLFRRATRNLSLE-----	52
PYTHIUM	-----EHAVDSEESVEHLQLAVADAMARS-----	43
PLASMOPARA	-----AQAVESIDEITLSHLRLEVESEAMLS-----	43
BREMLIA	-----EYAVDSVEETLAHLQTEVEEAMALS-----	42
AEDDES	-----KRFEHVRHWS---TPSPSRA-----	19
MIDGE	-----KNQSKCLEI---IGILTEHIEGLA---SP-----	43
BOMBUS	-----ERNSTNLTE---ILKDSKYYFQNI---AK-----	39
ANT	-----HOYFKDLPN---TLKDDQQYKLV---SL-----	39
WHIPWORM	-----GAALQAIEDLQD---IKH---LLSPFSG---QE-----	48
TRICHIANELLA	-----S---DQAEDCVQO---IPN---HPHLNG---SE-----	46
BEEBLE	-----VASKQCNQLLTN---FSD---ALTHEQI---NS-----	46
BARNACLE	-----GDPERAIGLILN---IKR---YLSEQF---TD-----	46
THRIP	-----HDAKILHR---IAC---HFQNYF---TS-----	36
FLA	-----KAKLCISN---ILR---FFKGEV---TS-----	41
WHITEFLY	-----D-AQAAENYKQR---LIA---LFSHFKA---QV-----	41
TICK	-----E-ALPLAEEVER---T---CVEQSF---SV-----	39
TERMITE	-----K-YIEAKNSISN---IIS---YFEDKR---KR-----	45
DAPHNIA	-----NVAEQVND---IKE---IVLKEK---ID-----	35
OSTREOCOCCUS	-----GGATSTSGTISV---IRE---RCSECT---ID-----	42
STENTOR	-----TOPESIIDE---IRA---IVLSFNL---SM-----	38
KLEBSORIDIUM	-----SAEELVRRVED---IAD---LCTNLT---SE-----	44
CLUBMOSS	-----SETDLGVTVDD---LSG---PCSOLV---SD-----	44
MOSS	-----GFPDLAPVVD---FSE---LCKDLY---SD-----	45
LIVERWORT	-----SASDLNSLISD---VAD---LCKQAL---SD-----	45
LIGNANO	-----LKEKA---LFN---VIFNEFASSNE-----	38
COPEPOD	-----TLNSAELLARS---VYG---LLESEL-----	45
GLOBOSUM	-----DIAEA---AVVD---LQN---QIVRM---HA-----	34
PALUSTRIS	-----ALA---EG---IQA---ALGDL---DH-----	46
NEOCALLIMASTIX	-----SISVE---LYN---PPYKML---NN-----	39
GLOMUS	-----EAVGEALRYSQD---IDH---IVSNDI---ED-----	51
LOBOSPOR	-----VIATN---ICS---M-VMEL---KE-----	45
SYNCEPHALASTRUM	-----SIASD---LAT---RVMAV---DD-----	41
FUNGIIVORUM	-----APAMVDQLTSECTPISEAINSSKDFEGD-----VE---LI-----	88
HALBUM	-----ATAAITS---ASGNSNNFSAIDKDGMLIEQ---LSN---VVLKELA---E-----	77
DPURPUREUM	-----NNLI---INNNNSFK-FENDLLLINE---LSV---ILLKELV---LD-----	80
PVIOLACEUM	-----VNNKNASNSLESDSVILIEE---LKN---VLLKELV---ME-----	75
AMPHIPOD	-----NGGFAKDIIVD---LSE---LLSSDT---TS-----	48
SHRIMP	-----DPDAAKDVID---IAE---LLAVDL---TP-----	49
MUDCRAB	-----NARSARDIVVD---ISE---HLTKDL---SP-----	48
TARDIGRADE	-----STDDNACDAVEQ---IGR---ICLAET---GL-----	46
HYDRA	-----DSIEVSTLANN---IFS---LALNI---AD-----	41
SALPINGOEA	-----RFIAAAAIAD---IAA---YTRTLT---TP-----	47
SPIDER	-----SISEKEVSILETI-QKLHD---DYLNFDL---KE-----	49
LIMULUS	-----EKADNIIKD---IYY---ICMDSRM---SE-----	47
SCORPION	-----HSSIVIKD---ISE---ICLRGTL---SE-----	47
ROTIFFER	-----VDAAKSVLDD---IVY---LCENL---NP-----	40
CIONA	-----YIQVEVQIKE---ISQ---LCNRF---SK-----	40
OCTOPUS	-----GKDRKQIVED---IAL---ICPNQL---TV-----	39
CAPITELLA	-----VNARISHESIGN---IGA---ICLNDV---NA-----	45
LIMPET	-----LDQIDSIVPT---LSQ---ICLHEI---TE-----	45
SCALLOP	-----VEQSNGISD---ISQ---LCLHEI---DD-----	45
LINGULA	-----RGGKRTFDLVRD---IAN---LCLKET---SD-----	46
OYSTER	-----KEQADSVAD---ISQ---ICINES---TD-----	45
SNAIL	-----YNLANGLIAD---IRQ---ICLHEI---SE-----	41
SPONGE	-----RYSYATEVAD---LYS---LCVEQI---TE-----	40
PRIAPULA	-----DPETAHSAVAD---LAH---KCLQDI---SK-----	47
DANTO	-----VAIVCHDIIGD---LGO---ECMITK---NE-----	51
ESHARK	-----AAAEHSIVAS---ISR---DFRCSIS---SD-----	52
BHARK	-----AAVESHSIVAN---LTH---DLH-NT---HE-----	56
XENOPUS	-----GAEGHSLHNN---LAE---ECLVSAL---GS-----	68
STERLET	-----AAVESHNLIIGN---LGO---ECMYSK---NE-----	54
GAR	-----TALECHSVIGD---LGO---ECLVVR---NE-----	48
HUMAN	-----AALAGHLIRG---LGO---ECVLSS---SP-----	48
PLATYPUS	-----SAVAAYLIRG---LGO---ECVLSA---GP-----	48
TASDEVIL	-----AALAAYHLIRA---VGO---EGVLCT---SP-----	49
COELACANTH	-----AAIEISNIFGN---LRQ---ECLVTS---DE-----	54
CAECILIAN	-----EAPVAQSLIRS---LGE---ECVTSS---GD-----	54
CANARY	-----SALHGYSLLRS---LAE---TCLASL---AS-----	44
OSTRICH	-----ERKD---VQA---DCVF---A-----	15
GECKO	-----AALHGHSLLRS---MAE---TCVTSS---GD-----	52
TURTLE	-----AALRGYHLIRG---VGE---ACVTST---GD-----	53
ALLIGATOR	-----MA---ALV---PVVIRT---GD-----	13
APLYSIA	-----NREQIEVIDD---IRQ---VCQHEI---KE-----	44
TRICHOPLAX	-----RGSNACDIASD---ITV---LCLQTA---SD-----	44
SOFTCORAL	-----GRE-AADICRD---LRL---YCIENI---NE-----	44
STONYCORAL	-----CGLDASNTVVD---LGS---FCLENV---SS-----	44
SEA ANEMONE	-----GQESA-EIARD---LRA---HCSQLR---DE-----	44
SEACUCU	-----AAEEAKNVIVD---LGH---VLLRPL---SD-----	46
LANCELET	-----GAVEAHNLVAD---IAQ---ICLRHT---AE-----	47
STARFISH	-----VAEKAQDLVVD---LGH---LCLRQL---SE-----	46
SEA_URCHIN	-----GPETAQDLVVD---IAQ---LCLNQT---RE-----	46

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	----AFI-GLCSSKIMASEK----- FLIEFL TNHVLDK---D-----TYAQT	73
TETRAHYMENA	----SQI-SLCNSKIFNSDL----- MLFTYLE NNRTYK---D-----NLQAI	74
STYLONCCHIA	----ADL-APISSKIFNSNS----- SLIFL RENSLHN---D-----KLSSV	73
APHANOMYCEsa	----RAAAELCCPRLFOTTPGQOHAP LLS IMOL---QD---Y---GTTKSTLGVV	95
APHANOMYCEse	----RAAAEKCCSRLFHGSSGP--TP SLLD ILQL---QD---T---GLRKT-YATL	92
PYTHIUM	----RGLAQOQTILLFQSHEPP--- SLMEFL DQSGRMS---E---DLRKRISHA	85
PLASMOPARA	----RASAQOQTILLFQSAEPP--- SLLRFL STSAEFT---D---GARKREISAA	85
BREMIA	----RASAQOQTILLFQSTDP-- NLLRFL SSSANFA---D---DARKREISAA	84
AEDDES	PPSLPKKT-VYRQYLLDTLINS-- NLLSFL SQRS--IKAS--GR---FKVNV	62
MIDGE	----SEV-YYAVELLLEWNEQK--- ILVRF LAKSLHLKLS--EK-----FNECN	77
BOMBUS	----DDS-ELMLSILFDKKK--- GLLSFL MNELGKYKPEK-G-----PDTAV	77
ANT	----EHF-ESVCSIEDERD--- GLLFL MVLLKQVKKV---D-----VDATL	78
WHIPWORM	----GDF-DFVVSHPAAKTD--- DLLGL LIRFLPLP---S-----PADGI	83
TRICHIANELLA	----RNF-GPCFNSLLSND-- NLLS ILSSSIGKT---A-----PAQTI	81
BEEBLE	----TYL-DQSLHYFFSTSS--- GLHTF VKKLINKK---P-----PKTSV	80
BARNACLE	----TDF-QFILSVLFPNDIA--- HLMGL LQDVREIK---E-----FGSFK	83
THRIP	----EDI-DLSLHLFQEEK--- GLKSFL DALS-NS---N---MKKVS	69
FLEA	----SEI-DFALSILFNEDD--- GLIIP LKQHISEV---Y-----LQESI	75
WHITEFLY	----DNL-DYDLSALFNEET--- GLITL LHLKLRKT---K-----YKSCV	75
TICK	----KDL-GYVTSLLAGDAQ--- SLVSFL LKXHVATD---Q-----LKDAK	73
TERMITE	----TDL-DGAFVLFDKKT--- GLIQF LQKALKQD---A-----FTEAI	79
DAPHNIA	----NESVIPVLLNRQN--- GLVPL LKSKFRFR---KEGNT---VEI	69
OSTREOCOCCUS	----GLLASGAIHAFDAER--- GLTAY VRETRNGRA---G-----GGPSA	78
STENTOR	----FSM-AFFSSKILASEV--- GLLOF LKRRTDS---D-----RLTWT	73
KLEBSORMIDIUM	----DEL-AFASVLFEDERD--- GLFAFL EAL--P---E---KALAKP	77
CLUBMOSS	----EDF-AFASAVFDRDT--- GLPCV DRDLRISR---E---RSVHKA	79
MOSS	----EDI-SYAIIVFDEDT--- GLFSI LESLLRVR---D-----KSVVRA	80
LIVERWORT	----EDV-SFALALVFDRED--- GLFSI VOLLLSIK---E---RSVVKA	80
LIGNANO	----NFKHNKYLALFDEPE--- GLVYR LOSKEVS---E---EDAK	70
COPEPOD	----RTLNDPFWLFIGTD--- GLFPK LKXAGEK---D---FANIL	80
GLOBOSUM	----DRK-PLAMSALFNKQQ--- GLLOL LRTNKDAF-----TS-KA	66
PALUSTRIS	----QDD-ALATALLFDAER--- GLQFL RLSLGNK---E---VHND	79
NEOCALLIMASTIX	----KEI-VYAMSLFNENN--- GLITF LTRTMKYK---E---HAYS	72
GLOMUS	----QEL-GLATQLLFPQI--- GLIKF LNDTSRVT---D---SVLAKA	86
LOBOSPOR	----DEI-DMATSLFPNPER--- GLMLF LKRALDKT---E---AHTGA	78
SYMCEPHALASTRUM	----IDR-DIVCSLLFDPEN--- GLLRF MRKNGSTK---D---STAVSA	76
FUNCTIVORUM	----SSA-SMISLLFVGNH--- GLIKF LKSLGQD---E---KHIKT	123
HALBUM	----DEI-GVAASLLFHGDH--- MLLKL FLERSVLIN---D---KMIKL	112
DPURPUREUM	----EEL-GLVASLLFPGDH--- MLLKL LEKSTLIN---T---KEIVKI	115
PVIOLACEUM	----EEL-ALASSLLFSGDH--- MLLKL LEKSTLIN---S---KEVVKV	110
AMPHIPOD	----AHY-DVHVSCLG-KN--- GLLQF CQRTVSRK---H---YGDAK	81
SHRIMP	----AQY-DLYISQVLG-EK--- GLITF GRSVSKDQ---S---FVEAK	82
MUDCRAB	----VQY-DLFLSHVFG-EK--- GLIAG TRVTKEQ---A---FVDVR	81
TARDIGRADE	----RDI-KALIPILAEESD--- GLFCA LLADAAGAS---L---V-ATV	79
HYDRA	----NEI-GYFSETLFNENN--- GLIKF LKLSIGSN---E---LENAK	75
SALPINGOECA	----PEL-ALAAAILLGSQD--- GLVSL LRQL---E---GLELYECK	80
SPIDER	----QER-EIGNARIF-CND--- GLLSL LRNLLIVK---E---LRNVK	82
LIMULUS	----KET-AYMCSLVPNEDL--- GLTVF LKKTASLS---Q---FONGK	81
SCORPION	----KDR-SYVCSLLRKEED--- GLHFL LEAVNTP---S---LKDSL	81
ROTIFFER	----QTI-TFCLSLFKEK--- MLLFL RKLTTRD---E---FRCK	74
CIONA	----QEL-GLYCSLLLNKSS--- GLLVL LRNKNVSLA---G---LKPSR	74
OCTOPUS	----KNI-ESVCTLLFDKEI--- GVVTF LRSNANQP---T---EIR	71
CAPITELLA	----SDV-DLAYSVIFNHET--- GLIKF LKLIQND---E---FEGCK	79
LIMPET	----KDI-DYCSSLFDKEI--- GVVTF LKIKSKKN---E---YQGSNA	80
SCALLOP	----KEI-DLCCSALFDKDK--- GLITF LKKTVNDK---E---FLGCK	79
LINGULA	----RET-DYCSSLFPNKDT--- GLVSF VKXVQKA---E---YDSTK	80
OYSTER	----KDI-DLCCSALFDKDK--- GLVSF LSETVTKK---E---FQTCCK	79
SNAIL	----KDR-DYCCSALFDKDI--- GLIAP LQVAAKD---E---FQSTK	75
SPONGE	----SEL-AYSSSVLFPNDN--- GLIKF LHDVTLE---E---FASCK	74
PRIAPULA	----RDV-DLTCVLPFSEDR--- GLVFL LRRAIPLD---E---FKLAK	81
DANTO	----NEL-VLQTSLLFAKEE--- GLLSF LRRSLSTE---KLGTTGVEILRETR	93
ESHARK	----SQL-ALQSSVFSKDT--- GLVFL LRKSLRFE---E---FRDGR	86
BHARK	----SRL-ALHSSLVFSKDE--- GLLFL LRKSLSNE---E---FRDCR	90
XENOPUS	----SAL-DLNTSLIFSKEF--- GLLAF VKXSLSSD---E---FKDCR	102
STERLET	----NEL-VLQTSLIFSKEK--- GLLAF VKXSLNIE---D---FRDTR	88
GAR	----NEL-VLRSSLLFSKED--- GLLSF LKXSLSSE---D---FRDVR	82
HUMAN	----AVL-ALQTSLVFSRDF--- GLLVF VKXSLNSI---E---FRECR	82
PLATYPUS	----AVQ-ALHTSLVFSKEF--- GLVFL IRKSLDIE---E---FRDCR	82
TASDEVIL	----AVL-ALQTSLIFSKEF--- GLLVF IRRESLSIE---E---FRDCR	83
COELACANTH	----NEL-ALHISLIFSKEI--- GLLFL LRKSLSSE---E---FRDNR	88
CAECILIAN	----SVL-ALQTSLIFSKEH--- GLLAF IRKSLGIE---E---FRDCR	88
CANARY	----GEQ-ALHLSLVFSQEY--- GLLVF IRKSLTIE---E---FRDCR	78
OSTRICH	----LPA-ALHISLVFSQEY--- GLLVF IRKSLGIE---E---FRDCR	49
GECKO	----VAR-ALQTSLVFSKED--- GLLAF IRKSLSTE---E---FRECR	96
TURTLE	----GAR-ALQTSLVFSKDN--- GLLVF IRKSLSME---E---FRECR	87
ALLIGATOR	----SAQ-ALQSSLVFSKQD--- GLLVF IRKSLSIE---E---FRDCR	47
APLYSIA	----ET-EVCSLVFAKDT--- GLISF LKQTNQSE---E---IQNGK	78
TRICHOPLAX	----AEK-AYCSSALFGQDY--- GVVTF LRKSLGLD---D---LDKCK	78
SOFTCORAL	----TQL-AYCSSLLFNQDD--- GLITF VKAVVQLD---E---FAKCK	78
STONYCORAL	----SEQ-AYSSLLFSGET--- GLVSF LKXVITLD---E---FQDAK	78
SEA_ANEMONE	----SELGARCSSILFDKKT--- GLIRF LKHTIANQ---E---FVECK	79
SEACUKE	----TEQ-AFATSEVPHKER--- GLLSL LKSLIAAKE---E---FTGCK	80
LANCELET	----RDV-AYCCSVLFOEST--- GLTAF LKKTVTLQ---Q---YLPK	81
STARFISH	----NEL-AYCCSOLFKNKN--- GLLVF LKNAIPKD---E---LKGSK	80
SEA_URCHIN	----NEL-AFCRSELFOKET--- GLITF LQKAVSKD---E---YGGSK	80

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	KKSLYQIIAKYIKNYVQ-----Y--VS-----EYLESIISTCIGNF--KKEE-SGV	114
TETRAHYMENA	RKGLFRPTAAVYIKLRKL-----K--VF-----EYIELICKNCKMSLF--KKEE-SNQ	115
STYLONCCHIA	KKKVVYELIIDYIKLRSQ-----E--AT-----PYLKLKDTCLRSF--RSDH-NSL	114
APHANOMYCESa	LGIALEHLITFIKDMQD-----T--TLRHAVAGHVGSITQACCILLSSQL-PSK	142
APHANOMYCESa	LAFTLEHLVTFIKDMHD-----T--IRQSLASHVETLVPTCCNVLTSSQM-ASK	138
PYTHIUM	RKIVLELVGVFKTYSQ-----H--A--AVARTHIVNTMKR--CQATARSQD-SNK	129
PLASMOPARA	RIGVPELLSALFKVYGA-----H--S--ALSQKHVIDLVK--CQQTARSDP-FNR	129
BREMIA	RGVLDLAKFLKVTGT-----H--P--ALSQKHVVLDLFA--CQQTARSDP-YSR	128
AEDES	-EEIFDLRRIIQKHS-----QLVR-----KSVESVRECRFV--QSSVSAR	103
MIDGE	-KRVPFLIQTITKHP-----DKIK-----IYSKNVDTICTIYI--QNVTSAL	124
BOMBUS	-KEAFHLEFLIEQFC-----DIFI-----PYVTGTRKVCQAL--K--TRCSAL	117
ANT	-KEAFHLEFLIEHYI-----TFCFV-----QIQKIKYVCOVL--KKNKANY	121
WHIPWORM	-GIGVDLIRTVICKASG-----I--RSD-----QRKTMICPALKCA-LVDHLKGG	124
TRICHINELLA	-VYGDIIIRLAIARTTS-----L--SPS-----HRKAIMRPTLRLL--KQDYLKGR	122
BEEBLE	-VKFELIYALINNFP-----F--KLK-----KYVSVIFETCFKVI--KSLLVSSD	121
BARNACLE	-VEGCRVTADLVSRAGA-----A--SLD-----CEAAGIRSTACLLS-GRPQETSA	125
THRIP	-SDVNLFEFLIVKLP-----F--SLE-----NYVVIIRDAMSIV--QRTSSSAE	110
FLEA	-KFSLDLILLVLEELP-----I--KIR-----EHIKEISKISIKTL--YTDKMAKE	116
WHITEFLY	-SYTLEISETILKDHK-----N--RVL-----QHVKEIAGFCVKCA-QEDSQSSD	117
TICK	-AKSLNLTGMPFVPA-----S--QLL-----HHALAIKDVSCQLL-FRDKAAKV	115
TERMITE	-KESFTLKLQLDVFP--K-----E--RMS-----CHVVQIKDLCKTCTI-LLEKKAEE	120
DAPHNIA	IKNVLEIFGHLEQFIE-----A--MS-----SHLVVINKNSTLQYM--NSK-DAK	109
OSTREOCOCCUS	RVKALETMYECMWRLGERDGGEG-----RIRATMDVVSQV--RREG-SNA	122
STENTOR	MSNALSLVSDYIERGN-----R--IN-----EYVIEIKVCLQMLASSTK--SSL	115
KLBSORMIDIUM	REKALAKYIKRYKD-----R--IA-----PYALIKRYCYDLY--RREP-SNS	118
CLUBMOSS	REKCLVFLGEPVRSVGP-----E--RAS-----LYCSLKENALRIL--RIDE-TRS	121
MOSS	RESCWSFLALFKKIGP-----R--AL-----HYAALLKEKSLTFP--RRED-SKS	121
LIVERWORT	RETSLNPFSEIEKVG-----R--IL-----PHVSPKENCLLIF--RRDD-SKA	121
LIGNANO	-KDGDLFTKLAQSPA-----L--LA-----TSLPKVKCLAESLFFSSIS-SAK	111
COPEPOD	-QDVLRLVLLLEKNPE-----Q--FK-----QHLADPQVLSDSL--FMNP-AAK	120
GLOBOSUM	K---YMLDFAE-----L-----LITCWLFF--SNSKELSA	92
PALUSTRIS	KAVICKALAGPMYETSS-----S--LR-----EYAIIDIQSICQSLF--SSFKESSK	121
NEOCALLIMASTIX	RQILLNLHLDLENFPN-----Y--LT-----EYIDKIRRISENF--FTEK-AAR	113
GLOMUS	KIALLFLFVIRKIQS-----D--IE-----PYTEIIRKVNHFGLI--NVDD-EAF	127
LOBOSPOR	KVTFLEPTAEFISRSRN-----A--IT-----PYIVDIKRTCLNLF--LNSD-TAR	119
SYNCEPHALASTRUM	VTTLLDFVSPFQKAGT-----S--LQ-----RYAPSLKQCQVALI--NAP-SSR	116
FUNGIIVORUM	KESLFLKMLWTIGI-----R--AR-----DYAQEIEVVCQSE--RREQ-SNS	164
HALBUM	KTSILNLSKLIKSPKL-----Q--VA-----DYVVPKISICISLF--RRDQ-SPT	153
DPURPUREUM	KVAIINLITEPIELGG-----R--TD-----DYAIAIKNTCISIF--RKDQ-SNS	156
PVIOLACEUM	KPTLLSISEFIVILQK-----R--TE-----NYALAINKLCISVF--RRDQ-SAS	151
AMPHIPOD	-KSALEVIKILLEKQAS-----K--VA-----QYTDEIFVSVLLY--RGDP-AAK	121
SHRIMP	-KSTLDVKTLIDKEAQ-----K--IN-----KYVDDIRKYTYLY--NVEK-STK	122
MUDCRAB	-NSTLDLITILMKDTK-----K--II-----KYVGDITNYTYFLY--NADK-STK	121
TARDIGRADE	-TAGLQFLIELEAVVQOEALRK--C--VL-----LALPRIWDTYAIW--RICS-AAK	125
HYDRA	-GDILRFLSEFCTKK-----L--VK-----PYIKGIKETCLALF--PCDT-SVK	113
SALPINGOECA	-VAALEFLAGIQRLEPA-----D--RL-----TPYAVRIKDTCTCF--RDK-RAK	120
SPIDER	-LNCFKLANDIESSGS-----L--IG-----EYGFIDLEVCKKYMQRDA-TAE	123
LIMULUS	-LEILDPLPKLLDNVKK-----K--AV-----SYGVRKDACFSVF--LRDQ-FAR	121
SCORPION	-IEALQFNLFLINIGN-----K--VV-----QHGIVTKDVFVTF--LRNQ-LAK	121
ROTIFFER	-VOLLQLEKETSAREK-----K--LL-----PYSPDKDCTCLLF--SSDK-VSD	114
CLIONA	-DLVLTFTVTFVPRVGS-----Y--VL-----QYVDDLRSCLNVF--RSDG-YSR	114
OCTOPUS	-HDILAMLINQKQFGE-----Y--LQ-----PYAADLKGICLKQY--NODD-SAK	111
CAPITELLA	-CEILELKTFSKFPG-----K--VH-----PYAVDVKDAQLQLI--TRDR-RAR	119
LIMPET	KYGLLELSDFIHKVGK-----K--AL-----PYLEIKEASLSNY--MTRD-FTK	121
SCALLOP	-QKLELLESGFIQVEK-----K--IL-----PYTVDIKDVCVSLF--FRDR-FAK	119
LINGULA	-TALLETCLFMERAEK-----K--VL-----PYAVDIKDVCTITLF--IREE-KAA	120
OYSTER	-QKILEFLSEFVQRIK-----K--II-----PYVFDIKDVCVSLF--FRER-LAK	119
SNAIL	-TNLLDFIGDLQKVGK-----K--LL-----PYAIDIKACVSAP--SRDK-YAK	115
SPONGE	-EELLKLSNFKNLSR-----R--VL-----SHIVPIVDVCFIF--MREK-SAK	114
PRIAPULA	-KELLQLHSFINNGQT-----R--IL-----TYAVDIKDTCLAVF--SRDR-QAD	121
DANTIO	-VEIMNFLGAFQRMSA-----T--VRGWEKNYAVELKDTCLVYV--TKDK-SAK	137
ESHARK	-EVLKLESEVERIGE-----A--VG-----RYACIKKTCVIVY--TKEK-AAK	126
BHARK	-EVLKLTPTAVEKIKE-----T--VG-----PYALDIKDVCLVIVY--TKEK-AAK	130
XENOPUS	-EALKFLYTFLEKIGS-----N--VQ-----PYAMDIKTLCVIVY--TKDR-AAK	142
STERLET	-EALKLITPFDRIAH-----K--VNGWEKNYACDIKDTCLVYV--TKDR-AAK	132
GAR	-EEVLKLSSTFLQRITO-----S--VKGWERNYAVDIKDTCLVYV--TKDK-AAK	126
HUMAN	-EELKFLCIFLEKMGQ-----K--IA-----PYSVEIKNTCTSVY--TKDR-AAK	122
PLATYPUS	-EALKFLCIFLEKIGQ-----K--IE-----PYSYDIKSVCSIVY--SKDR-AAK	122
TASDEVIL	-EALKFLCIFLEKIGQ-----K--IE-----PYSYDIKSVCSIVY--TKDR-AAK	123
COELACANTH	-EELKFLTAVPEKIGQ-----K--LN-----PYACNVKLLIFVPV--FFF----	124
CABCILIAN	-EETLFLCIFLEKIGQ-----K--VQ-----PYACDIKNTCTSVYV--TKEK-AAK	128
CANARY	-EALKFLCVFMEKVGQ-----K--IH-----PYACNIKTCTLSVYV--IKER-TAK	118
OSTRICH	-EALKFLCAFLKIGI-----K--VH-----PYACNVKQTCISIVY--TKEK-AAK	89
GECKO	-EELKFLCAFLKIGI-----K--IH-----LIAHDVKNCTIIVF--TKDK-SAK	126
TURTLE	-EALKFLCAFLKIGI-----Q--VH-----PYAHDKQTCISIVY--TKEK-AAK	127
ALLIGATOR	-EALKFLCIFLEKIGQ-----G--VH-----PYACDIKQTCISIVY--TKDK-MAK	87
APLYSIA	-SAALDIISGLIQKVR-----N--VL-----PYAVDIKEATLAVY--SCDR-PAK	118
TRICHOPLAX	-EDLLKLTAYMEKIGG-----K--IS-----PYAVDIKDVCSISLF--TRDK-AAR	118
SOFTCORAL	-EVILSFLAEYIAKVKT-----R--IS-----PYATDIKDIKCLKLF--TKDK-NAR	118
STONYCORAL	-IELLKFLQSVMMKMGK-----K--IN-----PYVVEIKDIKCLKIF--SQDH-SNK	118
SEA ANEMONE	-TELLKFLQSLVGLQNT-----R--VN-----PYAVAIKDIKCMKLL--FQES-SSK	119
SEACUKE	-EALRLIGGLFKKRHA-----H--LV-----EHAVIDKDTCTALY--LRDK-SSK	120
LANCELET	-VETLSFLAFLKIGR-----K--IQ-----PHAVEKVCMAVF--SRDR-LSR	121
STARFISH	-EQLLEFLHAFLLKAGS-----R--LL-----ARTVEIKKICISAF--MRDK-SAK	120
SEA_URCHIN	-VQTFELFLGVLQKAKE-----L--VL-----DHAKIKDVCMSLF--TRDK-LAK	120

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	LTAGVKGRIFQTLVLLIK-----RFNNDLGE---Q-----GTYLHAFQST	193
TETRAHYMENA	PTQKVKGSIWNLIHILFQ-----FFTDQLED--DLKA-----EIQTCVCKPEL	198
STYLNCHIA	PSATVKGTIWTLIGLLHE-----KYEQ--LN--DFKV-----ESQDVGFQEL	194
APHANOMYCEsa	CTQTVKGVLDVLDGLFN-----KYPDAMAV--HRAA-----VGRWIDQAL	223
APHANOMYCEsa	CTQTVKGVILELIGALLQ-----KYPQEMDS--SREN-----IRSWIEAAL	217
PYTHIUM	ASQTAGTKMLLEVGHHTA-----VFPDEVKT--VALP-----LIAWIEDQL	210
PLASMOPARA	AAQTVKGMLKVIYGLVE-----KFSAECLK--TVSP-----LLGWIEHEL	210
BREMIA	AMQTAGQMLELIGHLVE-----KFPDRDTSG--NVPP-----LLSWIEIEL	209
AEDES	LTRNFQQCLFLELIGLMAK-----DFPECVSE--SRQ-----R-KILDNMRVA	183
MIDGE	PPMRQQHSYQLLGLLSK-----NHPEKFLD--SQA-----I-ELRNQMIATV	203
BOMBUS	VNIKERSLLFSVLDLTIK-----HCPEVSEA--QETH--IIFQQLRNDPFIKQF	197
ANT	YRTEKRFIFCVKIKMK-----YKMYISQ--FTFL--TTLKRANNSASNEY	203
WHIPWORM	LQSGVKKALFILMSVAR-----HLPELLDK--RGKK--YAL-QFANALSEEI	209
TRICHINELLA	LQNGVKKGLIILHSLCQ-----EIPKELIT--ADYN--YAL-LFANIMSEEL	210
BEEBLE	KTDSVEEKTFIALGTFK-----HFQYLVPN--NES-----LRIVFLNGL	198
BARNACLE	APPTVRQQHLGLCALCQ-----HCPQQTAE--LA-----E-RACTALLDEL	202
THRIP	SKPTVLRKVVYLLGALAE-----HLPHDINF--LS-----K-RLLDALMDL	188
FLA	LSSLVYEQLFPLGLILAR-----DFPYEMQD--HVS-----RVQVLLYSQF	193
WHITEFLY	FSNTVKKQVYLLGHLGN-----SYPEVFNs--NP-----E-RFNFVFCIEE	198
TICK	LTPTVKEELICVLGVIAE-----CHQVATEP--YR-----D-KLALYLAEL	196
TERMITE	MPAKVQKHLHLLHIVH-----KYPECLRP--EET-----R-LRLRIYSEL	201
DAPHNIA	NASKSKMEFLMLGRRLAQ-----YFPNTLKE--KASR-----MINQILYEM	194
OSTRECOCCUS	NSKTVRGLILRVIAAHVGMKLGTLVDLGEKVA--EAPTAEW-----LLKASCRVL	215
STENTOR	MGSTLKGALFNMHMLVVS-----SFBNELSD--KIEE-----LQIMTIKLL	199
KLEBSORMIDIUM	TTATLKSFTVHMLLVE-----YFPEALHD--Q-IA-----FIMFLATEL	198
CLUBMOSS	TSGLSLRANILLITLAYSIE-----LFPsLYDD--GNVS-----TVRLCLNLT	206
MOSS	TNSTLKANILQLLDLIE-----YFRESFEE--ENVL-----AIIKLCLDIT	204
LIVERWORT	TSGLTRSLILLGLYLV-----YFPHTFSE--ENVN-----TLKICLDIT	204
LIGNANO	TSEGVTOGLYRALGSLCK-----HYPEEFQP--VAVK-----ISVNVVKSLL	193
COPEPOD	LSSTVKSQRLRMLRCLCQ-----FYPVRLKQ--LADR-----LLVNYIQFL	199
GLOBOSUM	LVSSVKCALLELFCACVR-----YYPDSFTI--DKQDPDQIKKRLLTISSCI	178
PALUSTRIS	LTSSVKALLRLLGNISR-----YYPSSIDA--QGIS--HLHH--ILMQCVSTL	208
NEOCALLIMASTIX	LSTSVKGDLLQFLKLIQ-----YSSDIPD--NQKK-----LYTRHCITQI	197
GLOMUS	SGVKAKAGALDMHGHIAH-----RFPYVDF--EKNK-----LIRVF-LANL	211
LOBOSPOR	MVATVKAELVLELHISR-----YFPKVAEK--RQS-----MVVRWCLTIT	202
SYNCEPHALASTRUM	ISASVRSKTLIMMFIAR-----YYPDAITD--NDVQ-----TLKRWTLSAL	199
FUNCTIVORUM	SSQTVKGLMELRFLFAR-----QFQKBMND--KICQ-----MHTIFLENL	246
HALBUM	LTQTVKAEELLETVLFTFTE-----YFTGIMFD--KSAQ-----LISIFMETI	235
DPURPUREUM	LTQTVRGEIIVVLLFTFTE-----YFSNHMPD--LNQO-----LSSIFMETI	242
PVIOLACEUM	FSQTVRGEIIVVLLFTFTE-----IFPTHMSE--KNNQ-----ICALLMETI	235
AMPHIPOD	KVPSVHHLELGLLTLFTF-----ALPEKAQS--QAVP-----TLKVLRDQL	201
SHRIMP	KGSTVLQHQLOTLGLMLY-----SYPQNLRH--QSPL-----LTKIFKQGL	202
MUDCRAB	KGSTVLHQQLRGLGLVAK-----VYPENVRG--HSAM-----LTKIYKDH	201
TARDIGRADE	VGITIKQALYGFQTMMAH-----KAPMVANE--FADS-----MFGLLRSEL	210
HYDRA	YSSTMREGLYNLMGSAFAK-----VVPPELMT--INER-----LSSLFLSFL	195
SALPINGOECA	LTQTVKRDMLHGHILIS-----LSPAFAS--SLSTS-----VLNVYSEL	210
SPIDER	LSPKAKEEVLCLGHIAH-----YYPEDFIP--YQER-----VLSMFLQEL	205
LIMULUS	LPPTVKQGLLCLLGLSLE-----YYPEYMIS--YSEK-----LCDLYLNL	203
SCORPION	TPPTVKQAYYLLGLSSR-----HYPCMQGL--CSEK-----LNLWHLKL	204
ROTIFER	LSSSLKANILSILRILCW-----YHPEVISS--KSNK-----CLEFLTTL	197
CIONA	TTSSVCCQVQVLLSLAR-----YFPGHMTT--MSER-----LYEIFLRR	198
OCTOPUS	TKLTVRAKIYLLFPTLAH-----HYPEFMSD--YAKK-----LFDIYLSAM	193
CAPITELLA	PAASVKAHIFHLGVIAE-----LFPKVMVR--GSKD-----LNLNYMTT	201
LIMPET	LTATVKGKIYYMLGVICE-----IYPEYMTT--DSTK-----LLDIYKSSL	203
SCALLOP	VSSTVKENIFVLLGVVAE-----VYPEHMTS--YAER-----FTGLCVTSL	201
LINGULA	HQASVKRELYLLGLFAE-----VYPEGMVN--YAER-----LTDLCVRTL	202
OYSTER	LPASVKESIYVLLGLLAE-----IYPEHMTQ--YAGK-----LVDIYLRL	202
SNAIL	LVPTVKNIGYVLLGVIAE-----VYPEDITQ--DSDR-----LVGLYVSAL	197
SPONGE	HSATIRGGIYHLLGVICE-----WFPPEHLVK--ISSR-----LIDIIYMSNL	196
PRIAPULA	LTSTVKQGVYHLLGVIAE-----SYPELMVA--YADK-----LISIIYVNL	203
DANTO	IPDTVLGCIYELLGVLGE-----VHPSEMVN--NSDK-----LYKAYLGE	219
ESHARK	FPDVLKYEYELLGVLAE-----VQPTMLH--NSEK-----LFCAYLNE	208
BSHARK	LPDVLKYEYELLGVLAE-----VQPTMLD--NSEK-----LYRAYLNE	209
XENOPUS	LSDTVLEKYELLGLLGE-----VQPCEMTY--NSEK-----LFPKFLGE	224
STERLET	IPDVLKYEYELLGVLGE-----VQPSDMLN--NSEK-----LYRAYLSE	213
GAR	IPDVLGNIYELLGVLAE-----VQPSDMTD--NSEK-----LYRAYLGE	208
HUMAN	IPDVLKYEYELLGLLGE-----VHPSEMIN--NAEN-----LFRAYLGE	204
PLATYPUS	ITDVLKYEYELLGVLGE-----VHPSEMLC--NSEK-----LFRAYLGE	204
TASDEVIL	IADTVLEKYELLGVLGE-----VHPSEMVMH--NSEK-----LFRAYLGE	205
COELACANTH	LPDVLKYEYELLGVLGE-----VQPSSEMLH--NSEK-----LFRAYLGE	205
CAECILIAN	VPDVLKYEYELLGVLGE-----VQPSDMLD--NSEK-----LFRAYLGE	210
CANARY	IPDVLKYEYELLGVLGE-----VQPSDMIN--NSEK-----LFRAYLRE	200
OSTRICH	VPDVLKYEYELLGVLGE-----VQPSDMIN--NSEK-----LFRAYLGE	171
GECKO	VPDVLERYELLGVLGE-----VQPSDMLE--NSEK-----LFRAYLGE	208
TURTLE	VPDVLKYEYELLGVLGE-----VQPSDMVD--NSEK-----LFRAYLGE	209
ALLIGATOR	VPDVLKYEYELLGVLGE-----VQPSDMLD--NSEK-----LFRAYLGE	169
APLYSIA	LSATVKANIYVLLGVIAE-----VFPPELMT--YSDR-----LVGLYTSLS	200
TRICHOPLAX	YSSTVKSMSYLLGLTIAE-----KFPYIMP--HAQO-----LTIYLNLT	200
SOFTCORAL	KKSSVSYGYSLLGLTIAE-----YFPEYMD--KADR-----LVQIYVGL	200
STONYCORAL	HSSTVKXWLFSLGLTIAK-----VFPPECVIS--HSDH-----LVKHYVSVL	200
SEA_ANEMONE	QOSTVRFWLYTLLGVFAE-----VFPPEHMLG--NADR-----LISIIYNLL	201
SEACUKE	APQGVKSGLCQLLGVISE-----VYPEEMLP--YSEK-----LTVIYVSM	202
LANCELET	TTATVKSGLSLLGVISE-----VYDMLVQKHPDR-----LLKVYISML	205
STARFISH	LSQTVKQGIYCLLGVIAE-----IYPLVMSG--YSER-----LISVYIATL	202
SEA_URCHIN	LSQSVKGIYQTLGVAFGE-----YYPQLMMH--YSDR-----LNFVIVSTL	203

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-I-----SOIKS---SKPEMVIIEIILKFFKQCLM-YHQ-FNQE-----Q----I	228
TETRAHYMENA	-Q-----VQMAS---QKPEVSVSMPKRYSLK-EIH-LSNK-----E----L	233
STYLONCHEIA	-V-----AQMS---EKPEIKAIIMLKFFTHSLVGECT-LDQD-----Q----L	230
APHANOMYCESa	-D-----KQFSS---NAPEMQIHCFCVLCSEILDEA---TYD---QSK---R	258
APHANOMYCESa	-D-----KQFAS---NSPELQIINGSFTCLAEIITAN---TYD---EGF-----R	252
PYTHIUM	-E-----KQFAA---ASPETLLVAGLLIIMLARLVVDFPSRYKED---ATK-----R	249
PLASMOPARA	-E-----KQFLS---TSPEMMIVNGLFLMARLLKCDAGRYKQD---DAL-----R	249
BREMIA	-E-----KQFSS---NGPEMMLISLFLMARLLECNKERYKQD---EAR-----K	248
AEDDES	-E-----GQLE-E-NYPSLISLAGALQCLTYFLVNFAP-DDAE---EGQ---EQQLNLK	228
MIDGE	-Q-----SLFKDDK-ASISMVVISAVELKSHLIHFTF-TIDE---DPQ---F---S	244
BOMBUS	-N-----PQT---MAHSLDIPQVLDNFNSLITRLTE---K-IEKK---Y---Y	232
ANT	-N-----DILKQ---FKTHKDFHFDLADMLDSVES-PDTV-RRMT---V---F	243
WHIPWORM	-K-----NQMHSGY-RVPAYNVIECFVNLNGCMHFAN-LPDGR-CLM---K---I	251
TRICHIANELLA	-K-----NQMCSSI-HSPSYSVIECFLLNDLLAHFSN-LPDGA-CRM---S---C	252
BEEFLE	-E-----TQMIK---LSSLNKQLSCLFTLDRFCASFPF-DMNSKEDVF---V---V	239
BARNACLE	-K-----ROLDSSRS-AKLEMTIVSIAOCLTCLLHSFQ-SADD---NPV---V---C	243
THRIP	-E-----YQIFH-S-RKVEFTIIECCLDGLTGLHLSFPL-DGST---DSE---R---C	228
FLA	-E-----TQTKN-L-VNTKLRIBHILTNFENMCTFPAP-DPEI---DTE---E---C	233
WHITELY	SK-----RKLDS-D-TAGVSAVLECFYLVVEYMKQFEL-PPQS---KS---Y---G	238
TICK	-Q-----RVC---SVKEKNVVAQCLQCLSGFLHFHGT-CFED---DPD---N---C	233
TERMITE	-E-----MOTSH-A-TAVKYQIIAACLNLTEFLYVFPPL-KPQE---K---E---A	239
DAPHNIA	-E-----KEMKQ---HDYKDRVVGSCLEALRGFLYSFQS-IVSQ---K---S---L	231
OSTREOCOCCUS	-D-----AALDDDEDLKKKEIILIASALDNLTSALTARHQ---ER---DRL---N---N	255
STENTOR	-R-----EELHK---GPKTEKTLAMLLKMAISGLKLFVRY---D---KQ---Q---L	235
KLEBSORIDIUM	-M-----AQAK---S-DKPEMLVAFILDNYSLHICDE-GEFF---GGS-QEM---A	239
CLUBMOSS	-E-----EOLKQSG-KDVTFLVIAAVKLDLSLQWFDN-TVPA---GGT-IEN---S	249
MOSS	-E-----EQLQ---KSPQLVLMASAKLDLSLQWFDN-SLPA---GGS-VEN---S	244
LIVERWORT	-E-----EOLRQSN-KDPLFVLVS-VIKLDLSLQWFDN-SLPA---GGS-VEA---S	247
LIGNANO	-V-----QKIKSDH-TKVQFAVIALFEFLSNYFCHFSL---E---EPD---L	230
COPEPOD	-K-----GCISSKS-GILDITVLEETLILDLDFLLNGGIL---DPE-DVE---N---L	239
GLOBOSUM	-N-----S---ANPDMELLASAVLCLSSYLHSFEA-SAAE---STE---E---C	211
PALUSTRIS	-F-----E---KNPDLQVEGATRALDMLPRADF---DRD---LGI---E---Y	240
NEOCALLIMASTIX	-N-----NFLQNP-K-SFDDYALITSIIYGLNSYLHSNND-IIIE-DKP---E---Y	238
GLOMUS	-K-----E---KSLTDAFTGLYSFLFAYS-D-SIKK---ENQ---E---D	241
LOBOSPOR	-Q-----EQLKPN---AKQELTLVAGLILDNCLYSFAD-KVT---RD---V	239
SYNCEPHALASTRUM	-E-----TELKKS---VAEQ-VLS---ALAMCCLLSRDD-VTLD---QQE---L	236
FUNCTIVORUM	-Q-----RQFKS---HKPMQLSLSLSEHFIPOFSDHFVD---TK---Q---V	285
HALBUM	-G-----SOLKS---KTPETFLIKSILSLNLSLNFSSDFISG---SSK---N---V	275
DUPURPUREUM	-G-----QOLKS---KSPETLIQCLKILNSLLVHFSGDFVSN---PK---N---I	281
PVIOLACEUM	-G-----AQLKS---KAPETYLIVCLKILNSLLVHFSGDFVAV---PK---N---V	274
AMPHIPOD	-N-----RH---TGARPDILTILSACVRILTYLHHPFD-GAHD---TPE---L---F	239
SHRIMP	-V-----KH---TGSKPDLNALAVLRGLALYLHHPFE-GIDD---DPQ---L---F	240
MUDCRAB	-A-----RH---MGQKTLIALAGVLRGLTYLHHPFE-GIDD---DPL---L---Y	239
TARDIGRADE	-Q-----KEWNA---KEPKYGIAGCLDPRGLHNFAD-S-DX---GSV---D---L	248
HYDRA	-K-----QEMESTKPKPELLVIAAGLNLGSLVLYHFTQ-SCAE---SSK---Y---A	237
SALPINGOECA	-R-----QMTGT---KAPELPTVECFRLLTAYLKTNPV-SCDP---SARQATP---G	253
SPIDER	-K-----SQMSAKV-KAFNVSTVAGCLLILKEYLYNFSV-MCSE---DTE---N---S	246
LIMULUS	-K-----QMTSKT-RKLEERSIVSCLQCLTYGLHSPFV-SVEE---DPQ---K---S	244
SCORPION	-K-----FHFTS-N-QKSESSIVVCLQCLNEFMHQFPL-QDTE---DTE---K---A	244
ROTIFFER	-K-----NEIMAKF-RKSDLSLALDRLMSYLMNFV---SE-TSD---H---L	236
CLIONA	-K-----LEMEST---KTADLKIIECLLHGLMFTPTS-AHDE---EPV---R---C	238
OCTOPOUS	-V-----AEFRSL---KKPEFLIACLECNKLLSKHTPYDLEE-GVK---K---Y	234
CAPITELLA	-K-----QEIESKT-HEPEYVLIACLOCLTHFMVNFQ-SADE---GAE---H---A	242
LIMPET	-K-----SQMSKT-NKPEMTIISCLLEHTSYLVNFQ-QSGD---D---S---C	242
SCALLOP	-K-----TEMTAKT-RKAELSIIAGSLAGLTSCLVNFQ-SADD---RSK---Q---S	242
LINGULA	-Q-----AEMNKT-GKPEIPVMTGCLLSSILTNFTQ-SAAE---GK---H---S	242
OYSTER	-K-----AEMTST-KKPELSVISCLLEGLASCLVNFTE-D---E-DQ---N---S	241
SNAIL	-K-----AEMTST-KKPEFPVIVCLOCLTAYLVNFQ-SSDE---GSS---H---S	238
SPONGE	-K-----SEMTVKTKKPELPIISCLYGLTAYLVNFQ-SASE---GSV---Y---A	238
PRIAPULA	-K-----NQMSKT-KKPEYPIVITCLRLTTCYLVNFQ-SADE---GSG---Y---A	244
DANTIO	-K-----QMTSST-KEPKLPVVAACLRKILALMVNFQ-SVEE---DPA---A---S	260
ESHARK	-R-----VQMTSAT-REPKLPVVAACLRKILTALMVNFQ-SMEE---DPK---A---S	249
BHARK	-K-----IQMTSAT-RQPKLPVVAACLRKILTALMVNFQ-SMEE---DPR---T---S	250
XENOPUS	-K-----AQMNSST-RNPKFPVIAACLRKILTALMVNFQ-SMEE---DPR---T---S	265
STERLET	-K-----SQMTSAT-REPKLPVVAACLRKILTALMVNFQ-SMEE---DPK---S---S	254
GAR	-K-----SQMTSTT-REPKLPVVAACLRKILTALMVNFQ-SMEE---DPK---T---S	249
HUMAN	-K-----TQMTSAV-REPKLPVVAACLRKILSSLCNFTK-SMEE---DPQ---T---S	245
PLATYPUS	-K-----MQMTSST-REPKLPVVAACLRKILSALMCNFTK-SMEE---DPQ---T---S	245
TASDEVIL	-K-----TQMTSTT-REPKLPVVAACLRKILSALMVNFQ-SMEE---DPQ---M---S	246
COELACANTH	-K-----TQMRSTT-KEPKLSVVAACLRKILTALMVNFQ-SVDE---DPK---T---S	246
CAECILIAN	-K-----QMTSTT-REPKLSVVAACLRKILTALMVNFQ-SMEE---DPK---V---S	251
CANARY	-K-----TQMTSAT-RGPKLPVVAACLRKILTALMVNFQ-SVDE---DPQ---T---A	241
OSTRICH	-K-----TQMTSTT-RVPKLPVVAACLRKILALMVNFQ-SEDE---DPQ---T---S	212
GECKO	-K-----TQMTSST-REPKLPVVAACLRKILTALMVNFQ-SMEE---DPQ---T---S	249
TURTLE	-K-----TQMTSAT-REPKLPVVAACLRKILTALMVNFQ-SMEE---DPH---T---S	250
ALLIGATOR	-K-----TQMTSAT-REPKLPVVAACLRKILTALMVNFQ-SMEE---DPR---T---S	210
APLYSIA	-R-----MEMTST-KKPELAIISCLLEHTAFMLNFQ-SAAE---GSK---Y---S	241
TRICHOPLAX	-K-----SQMTGKN-TKLDMPVIYACLRKILTSYLVNFQ-SVEE---ESK---Y---A	241
SOFTCORAL	-K-----AEMRSK-GKPDMPVVAACLRKILDSYLVNFQ-SVNE---GSI---Y---A	240
STONYCORAL	-K-----KLENLIPMQTRKT-KKPDMLIAGCLRLTSYLVNFQ-SVSE---GSK---F---A	247
SEA ANEMONE	-N-----SEMKSNGKSPDKQVIAACLRKILSSYLVNFQ-SAAE---GSK---F---A	243
SEACUCIE	-R-----QQMTSKN-KKPEMTIISCLLISHVLVNFQ-SVEE---DGK---H---T	243
LANCELET	-K-----EQMESRT-RKPEMLVISCLLEHTHVLVNFQ-SVEE---GSA---H---S	246
STARFISH	-N-----QQMTSKT-RKPELTVIAGCLTGLHLYLVNFQ-SVEE---GAK---H---S	243
SEA_URCHIN	-K-----QQMTTKT-KKPEMTVVAACLRKILSHLLVNFQ-SVEE---NSK---H---C	244

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	SLLYQALVTFCKPV--E---DLSTFKVPIAACKCMKQNLDI--PSHYLIITK--NAL---	276
TETRAHYMENA	EDLYKMKIGITEI--K---DVKTVSVINNALKVLTAYSHI--PKVQ--LLD-DSK---	279
STYLNCHIA	DALYVCLKTAIQPI--L---DMQHGVMKSAKMLLGTTHINL--FKKH--VTR--HAI---	276
APHANOMYCESA	DTLFPQIHVTLATA---ASGNLSRLAIVKACGLLGGKMHML--FAAN--LVEADPY---	307
APHANOMYCESa	DKLFKYMHVTLATA---TSGNLSRLAIVKSCLLLLGRHIQV--FSEN--IVRSPTY---	301
PYTHIUM	QQVYSYLLTRILATT---VEGQLSRNVTKASLQFLEEHGQT--FIDE--LGE--NGY---	297
PLASMOPARA	KKVYSYLLTIFATT---TNGNLSRYQVNTSAEHFLEKHAQV--FHEE--IGP--NSL---	297
BREMIa	KKIYSYLLTVFATT---VSGNLSRFQVNTSAETFLAKHAQI--PQOE--IGE--NGE---	296
AEDES	RRIYLVKLSQDWD--E---AVKERQAFRNALILLERHSAL--FSPF--LYV--DYV---	274
MIDGE	EKLYECMQLSDPDRLP---NPTTRVAFRNMLQLENYGGLHEIPTF--FFR--DYK---	294
BOMBUS	KELYTWKLELSNQ--K---YSVKVSMKSAINLLSRHIDL--FGDF--VYC--DYK---	278
ANT	HNSYEWIKYFSQTS--S---QKKNITMKSADILLCRIMDL--FRDL--LYP--DYK---	289
WHIPWORM	ENMYSMLKMIINPE--S---RPNRLGPVKAALSILTSHPNL--FRKG--LFR--DYE---	297
TRICHINELLA	SELFNLIKKACNPK--N---DVHRLGHLKAALSILFISRVQF--PRHH--PLD--EYS---	298
BEEBLE	NKVYKYIEFLAIPS--G---T--VKIANKAALTPLANNISL--FINL--MVD--KHK---	283
BARNACLE	GRIFDYVARVINPT--A---ELSRREAPRALALLATHAAQ--FSKH--MYD--RYV---	289
THRIP	NKIVDCLWKTLLLV--D---VH--RKTAPRAALNLLANHGQD--FRAS--LVL--KFE---	273
FLAa	LRLYNMKTMSYYPG--D---VK--FRPAPRAALSLLTKHGML--VSEH--LYK--DCL---	278
WHITEFLY	EKLYKLAKTICIFD--A---NRNRKTYQRAALKMMEIHSGL--KFNK--LVS--DYK---	284
TICK	FKLFKCVKRSITPS--D---RPRYDIPRAALILLSKHAAL--FGQL--LLD--DHR---	279
TERMITE	RRIYDCVTAIVARK---HKEMRVAPRCALGLIQAHHGQ--LAKF--LYD--EYK---	283
DAPHNIA	EKIHGVLMLISRN--S--TVEKKAISFTPKAVLNMLAEHAAL--FNKW--LLR--QYK---	280
OSTREOCOCCUS	ACVVRIVTRAVAVR--V---AGRHMDMTRSALELELSEHVTT--LRHE--FVK--VAP---	301
STENYOR	KDIFPIYKALLTFL-----KVGNIYSKSAKLVLSHNAEM--FKFP--IRE--YSV---	287
KLEBSORMIIDIUM	QLLYKCVTDIV--QK---DDLTRYAVLRSALKLLSRHNSL--FRDL--LIT--DIRKD---	287
CLUBMOSS	KRAYAYLEQVLYR---EDMKRYEMIRAGLRLARHAWR--FRLA--LFK--NSG---	295
MOSS	RRVPTCEBQVWPR---EELKRYEPLKASLRLSRHAGL--FRMR--LIE--SGI---	290
LIVERWORT	RKIYIFLLQVYYR---EDIKRYEVVRAGLRLSRHAGR--FALR--LVE--DSK---	293
LIGNANO	KQVYHLAVKTIAGK---NYQRYEAPQALLFANHCPV--FSAP--LAD--NVE---	275
COPEPOD	ETLYEVLKIKCRM--PDHEAQVSRGSMRAGLEFSAHSSL--FSRI--ILG--DVK---	288
GLOBOSUM	--ILSTIRKMIIP--L---ENQTRYAVPRAGLIFIRDHAEN--FRNQ--LCS--DRD---	255
PALUSTRIS	--IGGYVRMIEP--L---GELTQYSIPKAALQVIDHAAK--LQDP--FFE--NYA---	284
NEOCALLIMASTIX	VITITNLVKVILSID--V---NTLNRYEQIKACLQFVIDNGHY--ISKV--LFR--NCT---	285
GLOMUS	AYIFKCKMNSITM--V---ENDRTYSIVKTGLQYIDHSNI--FGFE--FLR--EYK---	287
LOBOSPOR	PTILQLVKTLYNVV---P---EDLSRFATPIAAMDLFAMHIL--FRSK--LID--IYE---	285
SYNCEPHALASTRUM	RQLYEADKTLIDL--P---EKLRYAAPMAALQLFCNHASL--FERH--LIV--DSE---	282
FUNCTIVORUM	QQLYHYVMAIMPP--P---QLVRYDIPKAALDIFSSHGSL--FKQY--LITQ--DAE---	321
HALBUM	QLLYQYLYICLDPV--S---SSORFDIPRAAMMVQRHSHL--FKQY--LITE--QSE---	321
DUPURPUREUM	QLLYQYIYICMDPQ--S---STQRFEPRAAMKIVARHSPL--LAQY--LAE--HSE---	327
PVIOLACUM	QMLYQYIYICMDPV--S---SATRYEVPRAMKII LHSHLL--FKQY--LITE--QAE---	320
AMPHIPOD	ADLYERLHKIINPA--L---NLPKREAPRVTELELHQHAAH--FSSQ--LLK--QHA---	285
SHRIMP	TELYKHHKVLNPD--L---NLPRRDAQRAALELHHTGAK--FSSQ--LFE--DCT---	286
MUDCRAB	KTLFEHVRRKALNPN--L---DLHRRDAQRAALELSSHGDK--FSAQ--LYD--HYD---	285
TARDIGRADE	DMIFSTCRKLIHIS-----DAARYAMIFAAKLLTEHMDK--FLKH--LLA--DKLT---	294
HYDRA	SITMKYVKMILLT-----DYSRYDVPKAALTLALHSSQ--FNEL--LTL--QAE---	282
SALPINGOEBa	VQIYNYVKMAINPD--V---TVKMTRFQVPRALDLFALHAAQ--FRSM--IAT--DFE---	301
SPIDER	YFIFDTARKLISNT--E---KFSKSSAITRAGLQLLAAHAHQ--FNDF--IFE--DCI---	294
LIMULUS	YKIFCYARSSILSS--V---EHSRFEMPFRAGLMLFARHAAQ--FNDP--LFD--DYE---	290
SCORPION	YQLFKFRI--LLSK--R---DVKRYDMAKASLTLSSHASL--LAQF--LYE--DSM---	289
ROTIIFER	RAVFNFKLSLSS--S---EDLSRYAVPKSALMLLKHCRQ--FDEL--LYS--DYK---	283
CIONA	AEIYKYAKTSMQR--E---SLTRYAVPLAAMKIFRDSHSSQ--FSNL--LID--DYS---	284
OCTOPOUS	YELFQAARSAAKPD--L---DLSRYEMPASLILFENHSAP--PIFK--LQD--CYE---	280
CAPITELLA	YSIYKYCVKTDQN--I---KKRYEMPASLGLMAKHSAQ--MSDY--LLD--DFK---	288
LIMPET	YYIYKCKMALKQS--T---TLTRYEVPKAGLHLLSKHASQ--FNEF--LID--DYE---	288
SCALLOP	YEIFKYARMAIDPK--V---DYTRYQVPSAGLKLFTKHAHQ--FSLY--LIE--DYQ---	288
LINGULA	YDIFKCTRMALNLE-----ETARYDLTRAALTLKRHASQ--FSQF--IYE--NHE---	287
OYSTER	YETFKFARMAIDPD--I---NYTRYDVPKAGLKLFRHSAQ--FKSQ--LAD--DYQ---	287
SNAIL	YEIFNYARMAIDHK--V---EFSKYDVPKAGLQLFARHAAQ--FSQF--LVD--DYE---	284
SPONGE	QDIYKYTRMAIDPL--A---NLTRYEVPRAGLSLIRHAAQ--FREY--LVK--DSE---	284
PRIAPULA	RDVYDCVMRCTGQH--L---SEIRRYDVAKSALMLLAKHAAQ--LDRF--LLA--DYK---	291
DANTIO	KEIFDYALKAISQP--T---DKRYAVIPAGLKLFAKHSQ--FGSC--LMD--HYI---	306
ESHARK	KDIFDYALKAINPQ--I---DLKRYAVPLAGLRLFTLHSAQ--FGTC--LMD--NYR---	295
BSHARK	KEIFDCAVKAINKL--I---DKRYAVPLAGLRLFTLHSAQ--FKTC--LLD--SYQ---	296
XENOPUS	KEIFDYVKAISPQ--V---EMKRYAVPSAGLNLALHSAQ--PSSY--LMD--DYQ---	311
STERLET	KEIFDFALKAISQP--T---EFKRYAVLVLGRLFAKHAQ--FSSC--LMD--NYR---	300
GAR	KEIFDYALKAISQP--T---EFKRYAVLVLGRLFAKHAQ--FSSC--LID--NYR---	295
HUMAN	REIFNFVKAIRPQ--I---DLKRYAVPSAGLRLFALHAAQ--FSTC--LLD--NYV---	291
PLATYPUS	KEIFDFAVKAISPQ--V---DLKRYAVPLAGLHLFTVHASQ--FGTN--LLD--NYV---	291
TASDEVIL	KEIFDFALKAISQP--V---DLKRYAVPLAGLRLFTLHSAQ--FSTC--LLD--NYI---	292
COELACANTH	KEIFDYAVMAISPQ--V---DLKRYAVPLAGLRFALHAAQ--FNTC--LMD--NYR---	292
CAECILIAN	KEIFDYSVKAISPQ--V---ELKRYAVPLAGLHMLAIIHAAQ--PGSC--LMD--NYR---	297
CANARY	KEIFDFAMKAINPQ--V---DQKRYAVPLAGLQLFIWHSAQ--FGAL--LLD--NYV---	287
OSTRICH	KEIFDFAMKAIRPQ--I---DQKRYAVPLAGLQLFGRHAAQ--FGTF--LLD--SYV---	258
GECKO	KEIFDFAVKAINPQ--V---DLKRYAVPLAGLHLFVHAAQ--FSTC--LLD--NYV---	295
TURTLE	KEIFDFAVKAINPQ--V---DLKRYAVPLAGLHLFVHAAQ--FGTF--LLD--NYI---	296
ALLIGATOR	KEVDFDSVKAINPQ--V---DLKRYAVPLAGLRFMPGLHAAQ--FGTC--LLD--NYV---	256
APLYSIA	YEIFKYRMAIDPN--I---EHTRYDMPKAGLKLTRHAAQ--FQQY--LMD--DYQ---	287
TRICHOPLAX	ADIYKARLAIDPK--V---ELPRYDLPKAGLNLAKHAAQ--PCDY--ISR--EAE---	287
SOFTCORAL	KNIYSFLRSALDSK--I---NYARYDVPKAGLNLFAHAAQ--YKEY--LTK--DYE---	286
STONYCORAL	KDIYTYGRMAINPQ--V---SLSRYEVPKAGLFLFAKHSQ--FKEY--IAK--DYE---	293
SEA_ANEMONE	RDYIEFTRMAIDVQ--G---TLQRYDVPKAGLNLFRHAAQ--FQY--ICT--EHNV---	290
SEACUKE	LDIYKFASLAMPSP--T---QLLRYGVPEAGLRLFGRHAAQ--FGSL--LYR--DYQ---	289
LANCELET	KDIYNFTRAVASQP--V---EMARYDVPKAAALWLLAKHAAQ--FNEY--LMN--DYE---	292
STARFISH	KDIYRFAARMAIDPT--V---DHTRYELNKAAGLNMFAKHSQ--FGPY--LYS--DHQ---	289
SEA_URCHIN	KDIYQYVMSVDPG--PYRSGTKPRYEIPKAGLNLIRHAAQ--FNEY--LYR--DHE---	294

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----TLFD---QYIKILQHRNRDL-KECVQELLELP IQKISQQLDHSINDH----	319
TETRAHYMENA	-----EIID---KVLGLISHNNRDV-KENASDCLESLLMALLATELDSYKHN----	322
STYLONCHEIA	-----ELVA---LTLKLCVNNMET-RDAANEMLVHMQEISDGTIDSSIH----	319
APHANOMYCEsA	-----QFYL---LMLHCASSNKKI-RKPAFACLDSPFAIADGPAAD-IPK----	349
APHANOMYCEsE	-----QFYS---MLLFCTSSNKV-RKPAFACLDGAFDIAQGLVCD-VAQ----	343
PYTHIUM	-----TWFT---YMRCAASESKTI-KENALACANNVLAVIGEFVLQVQES----	340
PLASMOPARA	-----AWFS---YMKSCCLSDNKTV-KHAFACSNILQVNSLYLAEAKDDM----	340
BREMI	-----LWFS---YVQCCSESNKI-KEHAFACSNVAVQVNTYLSVSHDDSD----	339
AEDDES	-----HWQN---LITTKWLRSSVED-RKVAYALHSFHREIARQLLAREDLSESTSD	321
MIDGE	-----SWHK---TLKKTWNAKLYED-KSVGIFATNAPHFQIATTIENRNSIE----	337
BOMBUS	-----YWYD---LLTNVAQDKNKVC-SQCGQYALRRFYRVIIGHILKHS-SEG----	321
ANT	-----YWHH---FLQRLSSETT-MY-GNSGRSALKFYQVIGQILTNQI-SEE----	331
WHIPWORM	-----LLNN---YFSHWSRHYDREL-RSLSLSAQDLLMHEVSAELLRTVEFDR----	341
TRICHINELLA	-----LLNE---CFSHWAKHYDREI-KTYSLNAEDLLIRELATELIPKVDSDP----	342
BEEFLE	-----YWHH---TLKWLKESGTE-D-QKIGILVLEAFYGLGTFLLNDG-SC----	324
BARNACLE	-----TLYS---HLVRWALSNNRDL-ARAGVGALDAFINQVCEWLTAP-TDD----	332
THRIP	-----DWHK---TLCRWLP I GKD-ERRVKGQALLTFYIIMANHTGQR-----	312
FLA	-----WVHN---TLQSWLKLSEW-D-ISIAPVAIEVFHQIARVLLIKK-----	317
WHITELY	-----WVHT---NLRKWLNTNNTKDNQTAVIEITLKSVCVRVIAKEIVDKD-TD----	327
TICK	-----TLYQ---ELGRWSRHGNREL-QSLGTAALSEFLREVASALVEHA-DR----	321
TERMITE	-----FWHE---FLLKWINISAG-ED-HKAGVSAALDVFNQVAVSLKDNPT-SE----	324
DAPHNIA	-----MWFQ---SLKTYVLLDKPGI-REISLNAFGKFEIESIKSLKSEADVA----	323
OSTREOCOCCUS	-----EVFQ---LILLMLRVSKTSDV-ARLAGEAYEKFLVAMSADPDSASP----	344
STENTOR	-----EVIR---TLFDLWLSNKHV-KLVLVQBTERRCLSVLSQSLQE-----	318
KLEBSORIDIUM	-----PAQSSDPHMFQ---YFRYSNHNVMHQI-RDAANHLEETLQVSKMLSEDPAT----	339
CLUMBOSS	-----DILLK---WLQIYCLHGASL-RSAAALPAYDQFVQVSISSCLISDDRRI----	338
MOSS	-----RNMH---WLQEHCHSNKI-RDAALPAYDQFITHVSSALVS-DSRI----	332
LIVERWORT	-----DILS---WLQVYCIHTNAPL-RDAGLILAFNEPISQVSNCLIHESRSL----	336
LIGNANO	-----VLFE---QFFRWSTHNRDL-MHVGMALDAFVKSVAATAASAASAE----	318
COPEPOD	-----FWFL---ELRKWSNSKNRDL-HKIGWKSALFRSREGLSGIDASS----	331
GLOBOSUM	-----TVLFIHSCLSKSMTHGNRDL---QNDTAMTSFLQVQAQALTRDKLSP----	299
PALUSTRIS	-----AIYV---DLRNASQHQNDV-SRLGYRAIDQPLKTIARVLLKSKSAEQ----	327
NEOCALLIMASTIX	-----IPFE---SLLTICKHQNRDL-HKLGQAMDHLLEINYSYSENIIDEI----	328
GLOMUS	-----EIWQ---CLWKLVRHRNPEV-RNAAFKAIWAFKQIARVLSNAT-EF----	329
LOBOSPOR	-----WMYQ---RIAGYCEHSHSGM-SKCGYNSLDVFLQEMANVLTSTEITE----	328
SYNCEPHALASTRUM	-----TLYS---RLSSIRFRHNDL-SKLGFRAMVDLIEOTANVLAKLTPGN----	325
FUNCTIVORUM	-----KMFQ---RLFALCKHQRK-LRSKAFAYEVFIQVSEFTSGSRNS----	374
HALBUM	-----KFFA---RLEEWCXINKKN-RDLAENPTIDSPLOQIANELTVGNRSI----	364
DPURPUREUM	-----KPYQ---RIEHWCHNKNL-RDIAFAVDSFPQVSKELTSGNRNF----	370
PVIOLACEUM	-----NPHY---RIEHWCHNVKPN-RDIAFNTVDVFFSQIAKELISGNRSF----	363
AMPHIPOD	-----LVYA---WLLRWSCASNTDD-LKAGRRAMESFLVLAELNPSDV----	328
SHRIMP	-----QVFQ---WVVKWCGSRNRDL-HKAALPAMDTFIVVIANMLEQAMED----	329
MUDCRAB	-----TLFP---WFIQWCSKNRDL-YKAALPALTDTIVLSNILEQSE----	327
TARDIGRADE	-----YTEMYG---DLKRWAVHTNSDA-RKLGFAALSIVYLKQVSRVIMHLEQG----	339
HYDRA	-----QIYD---ALELWINHQNKV-KKIAITATESFLYEVSCYISSVKNQD----	325
SALPINGOEA	-----LILQYL---SDSDSCDHHNKDI-KASAPRALEAFLOQVSAHMTKAGKSK----	346
SPIDER	-----DLYE---VLLQVWVHHNRDM-QKLGKAVAVLKVTEMMMSQYDER----	337
LIMULUS	-----NMYK---NFVHWCHQSNKES-RAIGYAALSFLEKIDTLLAKAREG----	333
SCORPION	-----NLYK---IIEIWHNSNRREV-RSLGYNALDAVFRQISDMLEQNTPE----	330
ROTIIFER	-----EIFD---RISQWSEHKVYDM-KKLAVALDSYKSLAEHIVKSNTE----	326
CLIONA	-----AFPS---AIEGWFHKNWOL-KHAANHWIISPLRQVTRNISDGTNN----	327
OCTOPOUS	-----DMYD---VFLKWFHHKNREL-ANHQWAMEAFYIYISQAVIYEDDAL----	323
CAPITELLA	-----DLYE---TLYSWTNNHNRDM-AHIGMLALEDFLQVSSALVTKVKEG----	331
LIMPET	-----DMYD---RLYFWSHHNRDI-LHVGMAMESFLKQVSNMVSYSL-----	326
SCALLOP	-----GMYD---KLRHWSHHNRDM-LHLGMSAMEAFLOQVSEMLVTRAEEG----	331
LINGULA	-----RLYS---VLLAWSQHNNKDV-SLGMALAEAFLOQVSEMLVTRAEEG----	330
OYSTER	-----GMYQ---KLSWSKHNREL-LHLGTAAMEAFLOQVSEMLVTKAREG----	330
SNAIL	-----NMYT---KLQWASKHQNRDV-LHHGVAAMDAPLQVIAEAITAKAKRG----	327
SPONGE	-----HMYE---SLSSWSNHNKKEC-RVVAVNAIGSFREVSTQISDPSISR----	327
PRIAPULA	-----AVYS---CLRSWSRHHNRDV-QIAGYAALAVLQVIAASVLVGGEET----	334
DANTO	-----SIFD---VMSKWCHTNAEL-KKSSYTALESFLKQVATLVAENIELH----	349
ESHARK	-----TVFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	338
BHARK	-----VLFE---TMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	339
XENOPUS	-----SLFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	354
STERLET	-----SLYE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	343
GAR	-----SIFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	338
HUMAN	-----SLFE---VLLKWCATNVEL-KKAALSALDSFLKQVSNMVAENAEHL----	334
PLATYPUS	-----YLFE---VMAKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	334
TASDEVIL	-----SLFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	335
COELACANTH	-----SLFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	335
CAECILIAN	-----SLYE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	340
CANARY	-----SLYE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	330
OSTRICH	-----SLFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	301
GECKO	-----SLFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	338
TURTLE	-----SLFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	339
ALLIGATOR	-----MLFE---VMSKWCHTNSEM-KKASYSALDSFLKQVIAHVAENAEHL----	299
APLYSIA	-----NLFD---KLLKWSRHHNRDI-LHAGAALESFVKEICDALVQRAQEG----	330
TRICHOPLAX	-----ALYE---VIVYWRCHNRDI-RAAAPHALEIMKQIAEYLVNEND----	328
SOPHCORAL	-----SVYN---TLFDWCKRKNKEL-RVKGFAALEAFLOQVIAHVAENAEHL----	329
STONYCORAL	-----VMYG---DLYRWCKHNNKEL-SYAAYAAMEAFQOISLVFVGHGD----	335
SEA ANEMONE	-----SLIVYP---AIYRWCHQNRKET-KYAALDAMDSFLKQVSEYIVLDEAEA----	335
SEAUCUKE	-----TIYE---KFLHWSSEHNNKDM-KSAGLSALETFLKQVIAHVAENAEHL----	332
LANCELET	-----DMYR---KLYEWSQHPNRDL-KQAGYAALDSFLKQVIAHVAENAEHL----	335
STARFISH	-----DLHE---AFNKWSAHNNPAV-KAVGFAAQEAFLOQVIAHVAENAEHL----	332
SEA URCHIN	-----MVYN---RLKYWSHSHNSEM-KWAGYDALQAFKVVVSHMLVENADKK----	337

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----KIIFNVLINKPETILND-----	NK-A-DM--FLMTVIIIRSV	352
TETRAHYMENA	-----ELSFNVIYIQRMSPLINQ-----	ER-Q-QIYTASITVVIKSI	357
STYLONCCHIA	-----DDIFRRIKMEFETILNN-----	ET-N-OTN-VLLISTIKAVG	353
APHANOMYCEsa	-----HKQFNRFKEFLTCLTD-----	KL-S--DD-KASIALAGLG	382
APHANOMYCEse	-----NKKHFNNKLEFLSCLTE-----	KM-S--DD-KVSIALAGLG	376
PYTHIUM	-----RKKTLNRLVLELPLVLD-----	KS-A--DTSTMAFALRCLA	374
PLASMOPARA	-----RKKCLANKVLEKVLVVISD-----	FG-A--STLAIITFALQCLG	374
BREMIA	-----RKKCLANKVLEKVLVVISN-----	ST-A--GTSTMSFAVQCTG	373
AEDDES	TAEGAAREARITVLANFPMKYFKTVLMA-----	PG-S--KPYEIRVAIRGFG	364
MIDGE	-----DRQILLFFPMKYFOETLES-----	PN-S--QPHEIRIAIRGFG	371
BOMBUS	-----D--KAIFLYFKMLFEQLKS-----	SHHV--NSNMLCYIITVGS	356
ANT	-----NDINDILVYFLQYFEKFRD-----	SN-L--DLITPRLIANGFG	367
WHIPWORM	-----SNARSYKYFSDIFDASLLK-----	ER-D--I--RRVSMIAKSV	376
TRICHINELLA	-----NHVRSVYKYFCNQDEIFSN-----	TS-G--I--REISMISKSV	377
BEEBLE	-----HYKHVTEYFKYFIANMTQ-----	SK-V--FNYDKRLCLOGLS	359
BARNACLE	-----GRPAKVPAPLLARLRELDLDD-----	RA-A--PPAVLSVAHVGYG	368
THRIP	-----GPKDLDFFCNHFKNQFO-----	-----MSMDVDIAVKGFG	343
FLA	-----ELKVLLEFFINFFKTQLQT-----	EK-I--KTYELRIVIRGFG	351
WHITELY	-----QGRQILLEYFSKEITNWSN-----	TS-C--IFQSADLSLDLLI	361
TICK	-----QDYLDIFQFFIKDFQRT-LK-----	ME-T--SNHGLAALKGYG	356
TERMITE	-----TGHVFLYFINFFKNMMLS-----	SS-T--SSYDMKLVIKAFG	359
DAPHNIA	-----KKSTVLEFFVRSLECVLES-----	DR-S--SL--QFRTVQ	353
OSTREOCOCCUS	-----REARTKLEKIMESIHIHLLDD-----	DS-A--SHRRRTACIRALG	381
STENTOR	-----NIDKYTFDYTIKMLMQILNS-----	-----K--SQEVLQSTIRYLG	352
KLBSORMIDIUM	-----EPLVRHYTYELMKAVFGILMD-----	PA-S--DLITPRLIANGFG	376
CLUBMOSS	-----E-DPRPTYKALMKHMLDTLES-----	QD-D--NPKVLSLAIRGII	374
MOSS	-----R-NAQALYAPVKDALDVLNA-----	QD-A--DPKRI SLAIRALG	368
LIVERWORT	-----Q-NVQERYKHPMTTFDILDA-----	PS-V--DKMLLSLAIRGVG	372
LIGNANO	-----SATPAQKFLFLFLOQFRQILDS-----	DG-S--SWKTVSVAVRGFG	357
COPEPOD	-----KNIPFVLQFLTDQFQITTRS-----	KY-S--SHKDISLAIQGYG	367
GLOBOSUM	-----SEIEIFWYFKVEFINNLNK-----	PET-D--QYAEVLSLAIRGLG	335
PALUSTRIS	-----DAKKCFWVMPQFTDILQQ-----	HK-A--AYKDVSLAIRGYG	362
NEOCALLIMASTIX	-----EAKKIFWYFIEFPTNSLR-----	KED-A--DTKDISLAIRGYG	363
GLOMUS	-----KEFDCVDYFMLIFDDIAGEIKKTSDQQLNKEEQD-----	Q--KTKDISIAVRGVG	377
LOBOSPOR	-----REYNCFLEFFANFTQIISTEVV-----	TST-A--QYKAMVAIRGYG	367
SYNCEPHALASTRUM	-----TEKGVFRFFFLKFFDEMNRRE-----	SED-P--DYRRIAAAVKGF	362
FUNCTIVORUM	-----SSDEATFFPIKRSYEMLES-----	SS-S--RLYEVSTAIRGLG	410
HALBUM	-----ESDQATFKYPIRKPYSIPEN-----	NN-S--TPFDISIAIRGCS	400
DPURPUREUM	-----EADQOTFKFPIRKPYSIPEN-----	ND-S--SRFELSIAIRGCS	406
PVIOLACEUM	-----ENDQSTFKFPIRKPYSIPEN-----	NT-S--SRYELSIAIRGCS	399
AMPHIPOD	-----AHTAFSHLVKEFNALLES-----	DK-SEGNSYCVSLAVRGYG	365
SHRIMP	-----DKRGVKIFKYLLOEYNKMLET-----	SE-S--TSKLSLAVKGYG	365
MUDCRAB	-----DKKTVEIFKYLLOEYNKMLET-----	GK-S--TNQVSLAVKGYG	363
TARDIGRADE	-----NNEGVCSTSAFSPMNEFNEKIKH-----	A-E--SPREMTVAVRGFG	377
HYDRA	-----TKILKVLFLFRPHKTLNS-----	PT-A--SCKEISMAIKGYG	359
SALPINGOBECA	-----DTMPMPGTLFRKPKAAMGE-----	A-A--SHRAVAIAIRGYG	380
SPIDER	-----KDVCSNIFKYFMNCFRDFILD-----	KS-T--TSKELQIAVMGFG	374
LIMULUS	-----KSEGSVFKFFITAFQOCMRD-----	NK-S--DSRDLVAVRGFG	370
SCORPION	-----DSCKAEIFKFFIEKFLMLIK-----	CS-E--NTRRVSTAIRGFG	366
ROTIFFER	-----TDCKRLIFKYFIQKYSMLTD-----	GN-K--DLKEMVSIKGYG	363
CIONA	-----NSSHLFNFMKPRAMLDSD-----	SR-T--SNKLSVAIEGYS	363
OCTOPUS	-----QKNMFEFFLEKSNVIKKN-----	KD-S--TKKEIDVAIKCFG	357
CAPITELLA	-----NRKEGAVFKFFIQKFRDIMDN-----	NS-S--GSKEIALAIKGYG	368
LIMPET	-----FGDSVFFFIQKFRQIMNS-----	SE-S--SDKEVSLAIKGYG	360
SCALLOP	-----H-KEGAVFKFFIQEFRTLMND-----	TS-T--SAKEVSLAIRGYG	367
LINGULA	-----H-PDRAAFAFFIQFRETLDN-----	PH-A--KQNEIASAVKGYG	366
OYSTER	-----K-KEAAMPKFPVTRFKEIMEN-----	SS-A--SAKEMSLAIRGYG	366
SNAIL	-----I-KEGGIFKFPVQVQPTTMQN-----	SS-A--SSEKVSMAVRGFG	363
SPONGE	-----ELGINSYKFFMKCFRSLMND-----	PD-I--NHRLLSIAVKGFG	363
PRIAPULA	-----RQRDTIVFVFFVREFRTIEA-----	G--T--DTRDVAIAVRGFG	370
DANTO	-----KSKLKFPMQKFCALIRT-----	MD-S--TNKELSLAIRGFG	382
ESHARK	-----KDKLEYIMQOQFYDIIRT-----	PE-S--SNKELSLAIRGFG	371
BHARK	-----KDKLQYFMQOQFYSIIRT-----	ME-S--STKELSLAIRGFG	372
XENOPUS	-----KNKLHFPMQOQFYEIIRK-----	MD-S--SNKELSLAIRGFG	387
STERLET	-----KSKLEFFPMQOQFYIIRT-----	LD-S--STKELSLAIRGFG	376
GAR	-----KSKLKFPMQOQFCSIIRT-----	TD-S--TNKELSLAIRGFG	371
HUMAN	-----KNKLQYFMQOQFYGIIRN-----	VD-S--NNKELSLAIRGFG	367
PLATYPUS	-----RSKLQYFMQOQFYEIIRK-----	ID-S--TNKELSLAIRGFG	367
TASDEVIL	-----TSTLRYFTEQOQFYGIIRN-----	VD-S--SSKELSLAIRGFG	368
COELACANTH	-----KNKLEYFMQOQFYGIIRT-----	LD-S--SNKELSLAIRGFG	368
CAECILIAN	-----KSKLQFPMDQFYRIIRK-----	LD-S--SNKELSLAIRGFG	373
CANARY	-----KSKLRFPMQOQFYGTIRR-----	MD-S--SSKELSLAIRGFG	363
OSTRICH	-----KSKLQFPMDQOQFYGIIRR-----	MD-S--SNKELSLAIRGFG	334
GECKO	-----KSKLANFMQOQFYSIIRK-----	MD-S--SNKELSLAIRGFG	371
TURTLE	-----KSKLQFPMEKFYDIIRK-----	MD-S--SNKELSLAIRGFG	372
ALLIGATOR	-----KSKLKFPMQOQFYSIIRK-----	MD-S--SNKELSLAIRGFG	332
APLYSIA	-----QTEGSVFKFLLIQFRTIMNA-----	KN-S--TDKHSVSLAIKGYG	366
TRICHOPLAX	-----AANINIFKFLPKFRSIIIDS-----	GS-S--DAKELALAIRGYG	364
SOFTCORAL	-----TVECGDIFKYFIKEFRRIINS-----	NE-S--LITREISIAIRGYG	366
STONYCORAL	-----KSDLAMFMYFIKTFRRIIIDS-----	VL-S--DTRQMLAIVRGYG	371
SEA_ANEMONE	-----VNPKEDFIQRFRAIIDS-----	DS-S--TTQQMSIAIRGYG	368
SEACUCLE	-----SNTDAAVQFFIQFRSSIDN-----	TD-S--GLKSWATAIRGYG	369
LANCELET	-----N-NKADLAVKFFIREFRTIIDT-----	TE-A--GTREMSIAVRGFG	373
STARFISH	-----DASDMAVFRFFVKRFRDIIDN-----	PQ-S--DTRALSSAVRGFG	369
SEA_URCHIN	-----RSSDVAVLKYFIKFRSTIDD-----	AS-S--SSKLSLTAIRGFG	374

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	HFAKAIANLRGE-KQLGDFDKLNDLGFERVLQVY-E-----DPYKEEENMKRGAQ	402
TETRAHYMENA	IFSKAIKHLQGE-DQLQLFKQMINLSEVRLKHI-EKDGVNSVVDQPVDEDTMKKGTG	415
STYLONCCHIA	IFSKAIKTKSGD-DALREYLKSLTTLSONKIKEP-EQQ-----EDPKNDYKN	399
APHANOMYCESa	NFAAIVPMFMA-DALPKIHARLIKYGEDLVAIRE-G-I-----EDPKNDYKN	418
APHANOMYCESa	SFAAIVPMFMD-GALSKIHTRLVKYGEDVMAMRE-K-M-----EDPKNDYKN	412
PYTHIUM	RIAPAIRMYLGE-KAFLKVEDRLKRFGENLLVDD-KAT-----	411
PLASMOPARA	WFASSIFTYLGA-KGYIKIEDKLRVYGESLLALDA-KTT-----	411
BREMIA	WLASSIYLYLGA-KGYTRTENKLYGESLLALDT-KAV-----	410
AEDES	SMAEACSLMTE-EYMNELLLVMQRTFVYLVEE-K-----	399
MIDGE	IMAGACQVLES-KYLSERFDLVQRTQYSYTND-R-----	406
BOMBUS	QLAAPCKIYLTN-NDVKNMPSLAINCAMPKCSRDD-I-----	391
ANT	QMAAPCKVMSD-FKRSYMSITTSYALPLCSSEY-S-----	402
WHIPWORM	RLFAVSHVLFEN-GEVNRLLRQLLPRPHQFLCHDE-G-----	411
TRICHINELLA	RLFQIGKALYGE-EFVCKVLRKLLQRFYLSSTSS-D-----	412
BEEBLE	SFSGVYQLQLE-EEKKLFQAIIQNPFQTYLNL-D-----	394
BARNACLE	ALAAPCGRLHPP-QELALLVWTLADRAERLYLAGE-SAP-----	405
THRIP	LFAKPMKLL-SP-EETPVFNIIAQKSHSEESFKS-----	375
FLEA	TFSSCCSALLSQ-DDIIPLYKIIQQTTEVMTSET-Q-----	386
WHITEFLY	IFVEPYKYSY-G-DDLSNLFSDIVKRAECLCAEKN-ESD-----	397
TICK	LFALPCKRYLKE-ADVLYMLNDVLRSEHVFSQIS-S-H-----	392
TERMITE	LFAAPCRVYMT-ODVLYMFTVMQRAEQIYFKEG-D-----	394
DAPHNIA	LKALGECSLSVTGDNIWHIFMYLFNKTAVICIQED--T-----	389
OSTREOCOCCLUS	KFAPALELGVGADMRALGRLEKLSMYTTFRQGHNEF-----	421
STENTOR	VFAADPIQFMQGE-NELKGLLEKLVMTGMASSDD-EHT-----	390
KLEBSORMIDIUM	KLAGALKFSQGE-EKLRKALNRLLPFGARFVSTG-Y-G-----	412
CLUBMOSS	KLAPVVKYSYSG-SLEKAFQRLVPPVFSFR--G-GDS-----	409
MOSS	KLAACIVKFSYSG-ECLKADPHRLEPPFGLSRL--G-DGR-----	403
LIVERWORT	KLSPILVKYSYSG-ETLEKVFHRLSSLGGTTTRGG-EVY-----	409
LIGNANO	YFAEAAKLLAP-PDMRQVADVVQRAEDLFTAES-DSS-----	394
COPEPOD	EFAEPLARFLSE-EKYLNLCEVLGQTEQHFHSESSQEQ-----	405
GLOBOSUM	LFATPCKVLLAE-KELKELQGLVLRK--LSSLSSGSN-----	369
PALUSTRIS	FFAGPCKQLLDP-QQLNMLHELVAKNAFLNSVGTGNR-----	399
NEOCALLIMASTIX	LFSGPKKYFNE-SEFNIIINELLKADSIKSNLNLE-----	400
GLOMUS	YFACSKRLDKE-ERYKPIFQNLNPNWAIKSNLNLEI-----	415
LOBOSPOR	YFAEPCRHAPD--QLKMLVQLLRKSSFLVSSNLNEGV-----	404
SYNCEPHALASTRUM	HFSKVPKFMQO-SEVQGLVQELVKKSAWIFTEGTLHEH-----	400
FUNGIIVORUM	YMAADPIQFMQGE-NELKGLLEKLVMTGMASSDD-EHT-----	447
HALBUM	RFAAPVKAPIGE-WELKSLLSLFXFKSEKLMVVKI-ENI-----	437
DPURPUREUM	RFAAPVKSPMGE-WELKSLLSLFXFKSEKLMVVKI-ENI-----	443
PVIOLACEUM	RFAAPVKSPMGE-WELKSLLSLFXFKSEKLMVVKI-DNI-----	436
AMPHIPOD	LFAGACKQLLPS-QQLRQLFSTVLTASQHFVQAS-ELF-----	402
SHRIMP	LLSGACRQLPSP-VEVHTMFSQVLTASQHFVQAS-DML-----	402
MUDCRAB	LLSGACRQLLPS-VEVHTMFSQVLTASQHFVQAS-EML-----	400
TARDIGRADE	AFVAPSRILLSTA-AQNEQMLSEMLQKSEQTFSSATEV-----	414
HYDRA	KFSLAFSNVMT-NEKISVFEIILKRESEMILLAN-----	392
SALPINGOEA	YLAAPCKLFCGV-DDLRMLSDLLARRCQQLYFHMGDDEQ-----	418
SPIDER	LFAGPCKLCLSE-VQVKMLQNVIQKSEHEFFSGG-KDI-----	411
LIMULUS	LFAGPCKLYLGE-EDVDFMYTELQRCQMYLTES-ILL-----	407
SCORPION	YFAKVKLYLGE-EDVDFMYTELQRCQMYLTES-ILL-----	403
ROTIFFER	AFAGPCKRELMPT-KMKLMLANIIDIIDRNFLSAD-SA-----	400
CIONA	LFAGPCKRFLPK-SEVRYMFTQMNQCENIPLPEKVDFF-----	401
OCTOPUS	LLAGPCKKPHQ-DDVDFMYTELQRCQMYLTES-ENL-----	394
CAPITELLA	YFAAPCKLYLTP-KDVLDFMFMNEMLRHSEQFLSGA-EQN-----	405
LIMPET	LLAGPCKRRFLNV-TDVFDFMFMNEMLRHSEQFLSGA-GEN-----	397
SCALLOP	LLAAPCKFLKQ-ADVDFMFMNEMLRHSEQFLSGA-ENL-----	404
LINGULA	AFAAPCKFHMTA-EDVDFMFMNEMLRHSEQFLSGA-ELK-----	403
OYSTER	LLAAPCKREFLQO-KDVDFMFMNEMLRHSEQFLSGA-KEDI-----	404
SNAIL	LFAAPCKIFLEP-ADVDFMFMNEMLRHSEQFLSGA-EPV-----	400
SPONGE	HFAKPCRLYGS-EDLHFMFMNEMLRHSEQFLSGA-DFT-----	402
PRIAPULA	SFAATPCKFLSE-ADVDFMFMNEMLRHSEQFLSGA-EMI-----	407
DANTO	LFAPCKVY-CP-QDVFDFMYTELQRCQMYLTES-DRD-----	418
ESHARK	LFAAPCKAV-NS-KDVFDFMYTELQRCQMYLTES-DTE-----	407
BHARK	LFAAPCKAV-DS-HVDVDFMYTELQRCQMYLTES-DTE-----	408
XENOPUS	LFAAPCKAV-NA-KNVDFMYTELQRCQMYLTES-DTE-----	423
STERLET	LFAAPCKAV-CL-GDVFDFMYTELQRCQMYLTES-DTE-----	412
GAR	LFAAPCKAV-CP-QDVFDFMYTELQRCQMYLTES-DTE-----	407
HUMAN	LFAGPCKVI-NA-KDVFDFMYTELQRCQMYLTES-DTG-----	403
PLATYPUS	LFAPCKVI-NP-NDVDFMYTELQRCQMYLTES-ETI-----	403
TASDEVIL	MFAGPCKSI-NA-KDVFDFMYTELQRCQMYLTES-DTI-----	404
COELACANTH	LFAAPCKAV-CP-EDVDFMYTELQRCQMYLTES-DTE-----	404
CAECILIAN	LFAAPCKVI-NA-KDVFDFMYTELQRCQMYLTES-ETE-----	409
CANARY	LFAPCKAI-HP-EDVDFMYVELLQRCQMYLTES-ETI-----	399
OSTRICH	LFAPCKAI-RS-KDVFDFMYVELLQRCQMYLTES-ETV-----	370
GECKO	LFAPCKAI-NS-KDVFDFMYVELLQRCQMYLTES-ETM-----	407
TURTLE	LFAPCKAI-NS-KDVFDFMYVELLQRCQMYLTES-ETA-----	408
ALLIGATOR	LFAPCKAI-NS-KDVFDFMYVELLQRCQMYLTES-ETA-----	368
APLYSIA	QLAAPCKMFLSE-ADVDFMFMNEMLRHSEQFLSGA-EEL-----	403
TRICHOPLAX	YFAAPCKTLLK-DDVDFMFMNEMLRHSEQFLSGA-IDV-----	399
SOFTCORAL	YFAKPKVFLKD-EDIKYMTSIIQMSQMYFNDS-ELK-----	403
STONYCORAL	YFSKPKLFMQA-DDVDFMFMNEMLRHSEQFLSGA-DLS-----	408
SEA ANEMONE	FFAKPKLFLMFTA-EDVDFMFMNEMLRHSEQFLSGA-EMQ-----	405
SEACUKE	FFAPCKMFLGE-NDVDFMFMNEMLRHSEQFLSGA-NID-----	406
LANCELET	FFAPCKMFLSE-SDVDFMFMNEMLRHSEQFLSGA-DSM-----	410
STARFISH	YFAAPCKLMTD-DDVDFMFMNEMLRHSEQFLSGA-EVS-----	406
SEA_URCHIN	YFAAPCKAFMKE-ADVDFMFMNEMLRHSEQFLSGA-E-----	409

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	PKVL-LYRQKQLNSPLISYANTLKQLSK-----ISD-KQIQHPLALCSLCTKQHY	450
TETRAHYMENA	FKPT-LYRQKQVISPITSPANILISQLDK-----LYED-ESQSLRLCMVGFQKFS	463
STYLONCYTHIA	FKQI-LKKQKQLLSPIESYSPILIONLDS-----EPSDEVHTFLKVCRIQVRRHR	448
APHANOMYCESA	----KLMWMLLCRYTTCYGRFVQKMQC-----QS-DI-VVQNSFVSLVCRLLDAYP	463
APHANOMYCESE	----KFKWMLLCRYTTCYGHFVVMQMS-----NE--A-AVENFAVTLACRILEAYP	456
PYTHIUM	----AMRWSVFSVSYVCGCFVQKERS-----TSIDD-TNITFLGDLICHLLDAYP	457
PLASMOPARA	----AWKWSLICQYVQCGQFVQHRSD-----VVLDE-GYIMFLERLILCHLMTAYP	457
BREMIA	----AWRWPFLSQYLQCGQFVQHRSD-----VVLGE-SFVKPFQDMMCHLMTAYP	456
AEDDES	----SNELLEHLPDFVQALSDIMSHVRE-----LTG-VQIIALQNIIGLVKDFH	444
MIDGE	----LKRROVLEHLPHYVESLSKIMTHLNE-----ISG-LQLQSLLETMVILIKDFH	453
BOMBUS	----EKITHLESICNTQEALESSEILHTSD-----LST-DOINIITKSLILIKRFP	436
ANT	----HSPTHESSICCTQEALESSEILCHMTD-----VTM-EQVITLTKLSAYTIFRFP	447
WHIPWORM	----PVEQVITHYVTSPLAENARALPLLNS-----VFP-DIMQIVDEDLHVKMFINIP	457
TRICHIANELLA	----AQQQNVYHITNILEASRLLCLSK-----IAD-DVQVLERPHVTLFHNFP	458
BEEFLE	----PSTDVLEPLFPYLQTVANFL-QFKT-----VTN-NELFLCQGLTILLMKLFP	439
BARNACLE	----PP-AELLQLLQPGHVSLLGCALALPT-----LPA-AQLATGERLILLVLEHYP	451
THRIP	----NHHRLADYVLSLMSFVSEAGV-----VHS-LQLSILESLSVQLICQYA	417
FLEA	----HKSIQNLPEYLESLSIILSHMPS-----INN-VHLKALQNLIVILFQEPH	430
WHITEFLY	----TAAEFVMARIGEPFLCANLAVCNCKD-----ITH-QQLVSELETIMVMKMPY	444
TICK	----AVLEDSLPLSSPQEAASILRCTGQ-----VPA-SQLALLEKLTVLQIENFP	439
TERMITE	----ISNADLQNLDPYIESLSIMRQLSA-----VTN-EQLVALQCLTVQLIENFP	440
DAPHNIA	----SKSLDILLVCLLESGLVITHCTT-----PLGT-ERTQQLQRMFVHLFRKYL	434
OSTREOCOCCUS	----GRFESIERQVLSLLSASQLLRKREI-----MVDE-ALIVTVGDLVVEWLEHFI	468
STENTOR	FK-SMFLQKLSLLELASSLDRANMMS-----LPE-SALLHFSDDAFELFRKI	438
KLEBSORMIDIUM	----DNLGHVTVLGAFAFMVYLYPS-----VED-SLISLITVAGATIFRYP	456
CLUBMOSS	----HEELGYAVTVVGAFAINVYIDR-----VED-FMVSILTETVGRIFPOYP	453
MOSS	----EGSLGYAVTVVGAFAIMVILHLD-----VED-LMVTPIAQVTVSIFFLYP	447
LIVERWORT	----ENYIGHSVILIGAFADIVNHFDR-----VED-FMVSPIAEVIGNIFYQFP	453
LIGNANO	----DERLSNLPSPFVESLSNLALHLDE-----LTG-VFLSLLARL SVTVCHMYP	438
COPEPOD	----EKWKLQFPSPHMSLAVMISLTT-----TSI-NLSFSLVLSFNLVKXFP	449
GLOBOSUM	----DAKYAHISAFMDAFKMTVHESVK-----VDT-ELLNAIEEELTSMMLNFP	413
PALUSTRIS	----EDILSHIPSPLEAYTFLADELDV-----IDT-ELLAAVEAIAKTMUTKFS	443
NEOCALLIMASTIX	----EMPLHFSPLQAYNSILKVSIDI-----VDN-SLLRGLIELITQLMISFP	443
GLOMUS	----THALSQIPLYIEAYCFIREYDE-----IFQ-QLMTEIHEVGLMMIYFP	459
LOBOSPOR	----DGSSTHLAAFISAYTNVAVYTE-----VPE-LLMSALQMVNAAIANFI	448
SYNCEPHALASTRUM	----RLLNYIPSPIASYQILQHVND-----VSS-QFVATLTRAIDVFTDYR	443
FUNCTIVORUM	----EQSASHLASTISAFASILQ-----E-TYLTHFREALCTVFRIP	486
HALBUM	----DETVMHLSSPINAENLILPEIKD-----IFY-WYMEHLQAVQATYFIIFP	481
DUPURPURIUM	----DEITLHLSSPINAFASTLYELSE-----LEP-WYLDHIEQLLETYFIIFP	487
PVIOLACIUM	----DEITLHLSSPINAFASTLYELNE-----LEP-WYLDQIEQVLETYFIIFP	480
AMPHIPOD	----DTKLANLPNFIQSLASILKHLDP-----ADS-ASVSAVLELSVALTRHYP	446
SHRIMP	----ENKLTNLPSPYIESLAIILSNMDV-----VNS-GILENVQOSSLAVEHFP	446
MUDCRAB	----ENKLSNLPSPYIEALDIICNMST-----INV-GIVENMLQALALVENFP	444
TARDIGRADE	----IGESRLEHLPTFLDTSAMVQDCGS-----AVPD-AFLAAVQRCLSLVIQMPF	461
HYDRA	----ELPHQLPTYLESLSCLIKIFTS-----VNY-SLLHPIEKIIIFIFENIC	435
SALPINGOBECA	----ESSAIHASYIDATARLIQOLEE-----SGD-VFLPILERLIVLLEAYP	462
SPIDER	----DDKIVGLANYIEALSSIVSVTEC-----MTD-NILISLEKLVVQIDKFP	455
LIMULUS	----EEKIQLPSPYLEALASISQLNE-----VSE-THLERVVKLVVQIEHYP	451
SCORPION	----DERIQLPSPFLDSSILQLQEB-----ISE-SSLNVEKLVAVPQIQMPF	447
ROTIFFER	HNETYDEKIFQSSIFLESVCVQSDS-----FSE-OSLMTWKEKLVLLADCPY	449
CLIONA	----DNRTHQLPTPVQSLASITKQIESKNENDKNPIGLPE-SYRTSLQRSLVLLERYP	455
OCTOPOUS	----HDQLYSLRGYLEASSILKEIDC-----ISD-ESLKIIEYLLVAMLENFP	438
CAPITELLA	----DRRIIGLHSLFGALASIVLELDQ-----FSE-TFLVSLERLIVLQMVLP	449
LIMPET	----QDKMYGLHSYLDALANILKEIDE-----LSE-TYASIVEHLLVMQIQMNP	441
SCALLOP	----EERLFLNLPSPYLEALGNILKQLEDE-----ISE-TYALSLEKLVLLIEKLP	448
LINGULA	----VDNVYQLPSPFLQIASVILHLD-----VSD-TFLVSLERLIVVQIDNFP	447
OYSTER	----EDKLYSLPSPYLEALGNILKQLEDE-----VPE-TYATSIERLMLILLENFP	448
SNAIL	----HEKLSLSDYVHLALANILKVVTK-----VSE-VYALTLERLIVLLENFP	444
SPONGE	SSSVAFERFLPTFIEALANISKEIQN-----LPD-VCLSSQLKLVLLFHCYP	451
PRIAPULA	----DSRMVELPPLLEALASIVLELDQ-----VSE-SFLASLEQLVLLVGNVP	451
DANTO	----DDNVYQLPSPFLDASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	462
ESHARK	----DDNVYQLPSPFLDASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	451
BSHARK	----DDNVYQLPSPFLDASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	452
XENOPUS	----DDNVYQLPSPFLDASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	467
STERLET	----DDNVYQLPSPFLDASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	456
GAR	----DDNVYQLPSPFLDASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	451
HUMAN	----DDRVYQMPSPFLQSVASVLLYLD-----VPE-VYTPVLEHLVVMQIDSFP	447
PLATYPUS	----DDHLFQLPSPFLQSVASVLLHLD-----VPE-VYTPVLERLIVVQIDSFP	447
TASDEVIL	----DDHMVQLPSPFLQSVASVLLHLD-----VPE-VYTPVLERLIVVQIDSFP	448
COELACANTH	----DDNVYQLPSPFLQSVASVILHLD-----IPE-VYTPVLERLIVVQIDSFA	448
CAECILIAN	----DDMVYQLPSPFLQSVASVILHLD-----IPE-VYTPVLERLIVVQIDSFS	453
CANARY	----DDHLYQLPSPFLQSVASVILHLD-----VPE-VYTPVLEHLVVMQINSFP	443
OSTRICH	----DDHLYQLPSPFLQSVASVILHLD-----IPE-VYTPVLERLIVVQIDTFF	414
GECKO	----DDHLYQLPSPFLQSVASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	451
TURTLE	----DDHLYQLPSPFLQSVASVILHLD-----IPE-VYTPVLERLIVVQIDSFP	452
ALLIGATOR	----DDNVYQLPSPFLQSVASVILHLD-----IPE-VYTPVLEHLVVMQIDSFP	412
APLYSIA	----DEKLSISPSYLTALSHIRQVDS-----VSA-PYAVVLERLIVLLENFP	447
TRICHOPLAX	----VDKIYQLPSPFLQSVASVILHLD-----VND-TFTRSLKLTIVLLENFP	443
SOFTCORAL	----EKKLQNLSPFLQSVASVILHLD-----IPP-AFLSFLERLIVVLEKFP	447
STONYCORAL	----EDRAQHLPTFLEALSSITIEELDK-----ISD-SVLACMERIVRVLFDKFA	452
SEA ANEMONE	----EDRVQQLPSPFLQSVASVILHLD-----ISD-GFLVSLERLIVLLENFP	449
SEACUCIE	----EDRFMQLPSPFLQSVASVILHLD-----VPE-SFLNSLEGLTIVAFRSYP	450
LANCELET	----EDKVHLLPSPFLQSVASVILHLD-----LSD-MFVTSLEKLVVLEKFP	454
STARFISH	----DDKLNQNLSPFLQSVASVILHLD-----LSD-SFQAALERLIVVQVSSYP	450
SEA URCHIN	----ERLSQLPTYLEALASIVQLD-----VSD-TFLTSLERLIVVLEKFP	452

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	NYFE--NYRPLYDGHANI I I S I F---GHQT-IGIQPVGSLLSKVIEEL--KLQGNQL-	501
TETRAHYMENA	SFYE--KYKEPLNGBIVQLMREMK---KHQS-IYIIMLENLQNLVQVSI--KLPDMSPL	515
STYLONCRIA	KLQY--KYRDRFYEAASPTKALS---KHOK-AFANWIKQFVDLSLILQL--KIPDAVLF	500
APHANOMYCEsa	SSAI--VVKYQAEALVMSADAFS---ST----DVMKRILQHMVLV--SNRIDTDP	510
APHANOMYCEsa	SSAI--VVKYQAEISLVSIQALP---TG----NAIDRVIRHGIILLV--STQLNPSQ	503
PYTHIUM	RCLW--KSKLTIYKLSILCAVH---SS-GDVQLLDRIVHRAFLLSI--SNVTETEE	508
PLASMOPARA	QCLL--KSKSVVHKSLAALFVLSL---KW-TVIDPVVDQFVHHLLFSI--ADITDPDQ	508
BREMIA	QCHW--KSKVVKHPIAALVLSL---KW-TVIDPLINRFLVHLLMSI--SSVTESEDE	507
AEDDES	YLSS--SYHELIVSSLMKTFDNLG---KGGVLDNLLKIVLRITITWC--SHMLVVDV	497
MIDGE	FLST--AHHPLVASSLLETLLMLQ---KLGKMLHDVMSIVVQIITWC--SHQSVYDL	506
BOMBUS	EFVY--SNQNFVSLVNTIINIM---TINRDLLEFLVNLINVMVMS--LHPLFVDA	489
ANT	DLTK--SBNALAVLILKTIISNLA---TVMKSLLRVLDIVYVAVMC--SHTLALDA	500
WHIPWORM	ALGA--KWTARCKQVYIYAFPAAL---TKN---RSYITSVVDQKLLHL--TLPPTLDG	506
TRICHINELLA	LMEX--RFYHRCKVINVATFAAAY---GHN---YQYIQSIVPQSLIRNI--ASLPSVGK	507
BEEFLE	QLPY--YCHPLVTEALVLTFFYLL---LNSEHIFNTPLENVIFQVVMVC--SHQHITEA	492
BARNACLE	RVPY--THRFADGGVARCLLALL---GRPE-LAAPCLRRLLVQMLRQC--SHALAVET	503
THRIP	KEEH--PDWRVVMVAVICTLQRL---RKCGVALDSFMNVHQBILRSV--THPVIEDA	470
FLUA	QLSG--SHHNLCIESLMKTFFNIT---QINGCFYEEVLEVTVIYHVGIC--SHPIAIES	483
WHITEFLY	DCGR--N--WKASQTIERTVLCLL---LKSEKTLDTYLGIVFQGITRC--DTLLLDQV	495
TICK	LVAQ--NLQMRKCKSLFLVLLAV---YPIRSRSLSQIVYQGLVRC--SHPIAAQV	488
TERMITE	KLPK--PFHWLAIRAITVTLSSLA---ESGGTFLEELFNSVYQGITRC--KHQIADV	493
DAPHNIA	DIDE---GNRCGRSAVFLVGVHAAIENQI--DFSTFVRDVIQILIRIT--RPE-----	482
OSTREOCOCCUS	FEQS--RRKPLIQNALWNLFVALS---SKGC-ALQTLTRIGAKLLGLLRVSPDPVK	522
STENATOR	KIHE--RYRQRMNSIAQLFASLH---LHHE-KFTDFWRFPIAKSHQGL--EIPDFID	490
KLEBSORMIDIUM	LLWE--KQKPAVHTAFVMLCSLY---PKGE-AFTSFLANIVSIVVDM--SHDDPAP	508
CLUBMOSS	SLFP--KORVAIHSTLSSLLKALY---PKGN-LFVMPLMNVVMSKLRPT--DTD----	500
MOSS	QLPA--KQKQAVYALRNLLKALY---PKGP-VYFLPLRNIVVMSLQRDM--EPVDEALE	499
LIVERWORT	ELYP--KQKQGVYNTMSAFFKAMY---PKGP-IFSIFLNVVMSLERNM--ETSEGVSG	505
LIGNANO	RVSE--RMGRVGLRAVAHALHRLR---SRRPGLAKAFAPVYQSLVRC--SHEHPVYQ	491
COPEPOD	VLPH--QYHGFAIQALLQVFOCTA-----VSDTMLDNVYQVITESC--SHPVAGET	497
GLOBOSUM	KVRE--YYRKLVSAPVELMWELN---IHGL-L-WSPWGGIAKRLIIRC--VDKEEDRT	464
PALUSTRIS	SMGA--AYRGLSVSAPRNLLVGLN---KKG-IGTALWSKIAIYVIVIRC--TSTSSDDI	495
NEOCALLIMASTIX	LLND--KLKFINAKSIQHILWELN---NK--SIMDTFFNKIASDILVLC--LNKEQKET	494
GLOMUS	RMVY--DLRLRCVNAFHEHLLWMLY---LKGRGTMEKFKVSKFYQILLIRC--SDAIIQLQ	512
LOBOSPOR	RMST--YARIDCTISIVRLLVMLF---YKGEALRGFFDKFSYKLLVFS--ADIARQP	501
SYNCEPHALASTRUM	RLSS--WARESGTVAIQDALHSFY---SKSEGDLRAFATTFYVNLITWC--TETRDPAP	496
FUNCTIVORUM	DLIF---RDCYCLASRLIITALC---SKGT-SLQSLDRVYQGLIIRC--SVPRIIDG	536
HALBUM	YLPT--VQREYRYSAWNRLLSSLY---HRPE-PLKTLGRVIRVQGLLIF--SKPHEALL	533
DUPURPUREUM	HLPV--KSRDRYPKAVNRLISSLF---YHGE-YLKILSLRIVKXKLLIF--SKNPSIK	539
PVIOLACEUM	HLPV--KSHRFHMAVNRLLISSMY---FRGE-YLKILSLRIVKXKLLIF--SKNPSIK	532
AMPHIPOD	QLAA--PERGVAAHALLLTLLATST---AAPG-L-SCIRSSVHQQIILLC--SHSVPGDD	497
SHRIMP	LVSS--FKRFLAYRALFLFFTVY---NKP-YPHEFLHTFVYKAVILVC--SHAPEVES	498
MUDCRAB	SVSV--YKTFLAYRALFKLVYAIH---GKAE-YFQDFIHSFVYKVIHVC--SHAPEIDS	496
TARDIGRADE	QLGP--HIQHTACQAVVKTVMVVA---RACP-TANDFVGEIVYKGLRGC--LLEMPSDV	513
HYDRA	NLKG--TGLALYMKGIATFIDSVS---STQS-MIKTSLSRIVYQILLIRC--SHSTLSEE	487
SALPINGOBECA	SMYR--TQRASVHLSLTRCFVSLY---HRGS-TLQTFPAKVAHVHLSRC--SQSIRDTE	514
SPIDER	KVPT--AYNFIVSKAIRMFLAVL---PKRD-MFIFGLSQIVYQIVKVC--SHPVVVEA	507
LIMULUS	QLAD--VHHFLSYRSIRITLLAFA---PKKA-VFKRFLGNIVYQGLIRC--SHPVVAEV	503
SCORPION	YLPY--PYHFLCINSLIKLFLAVH---SKGP-QFKGFLANKIITQGLIRC--SYVPRFBI	499
ROTIFFER	KLVK--RYNMOISLAAALFLAQ---R-TN-FSDFEISRTIYHLLIFP--SYKTLVSV	500
CIONA	KLHR--KYSFLCHNALISVAAAPL---EKOE-ILKTLLESIVYQGLIRC--AYNVVGT	507
OCTOPOUS	QVYF--KYHFCKVKALKVLLALL---PKET-HLREILRETVYQGLIRC--HLATPLKE	490
CAPITTELLA	RLHV--KLHNQCYIALIRLFLGLA---LKGS-IFKGFLEIITVYQGLIRC--SHPVIVLES	501
LIMPET	MLNE--KMHFMATKSVIHLVLLALM---CKGS-VFNQVLSGVVYQGLIRC--SHPVIVLET	493
SCALLOP	SLPQ--TLSFICLKSILWLLAVM---PKGT-TFQQIMSGVYQGLIRC--SHPVIVLET	500
LINGULA	SLYK--KRKLDVQSLIGIFHALI---SKGP-TLRIPLGRVYQGLIRC--SHPVIVLET	499
OYSTER	TIHQ--KQHFPSVKSLLWVLLITL---PRGE-VFSQVLSGVYQGLIRC--SHPVIVLET	500
SNAIL	TIYR--GFHFCLKGLHLLVLLVQ---SKGS-TFNKLSGVYQGLIRC--SHPVIVLET	496
SPONGE	FLSS--HVRYQGSVSLKLLIMAVS---SIPT-SFKQFLSHIVYQGLIRC--SLPVVIEA	503
PRIAPIULA	LLRRESRLDHRACGAVRVLLALR---SKRA-TQRSVLRVYQGLIRC--SHPVIVLET	505
DANTIO	QYSQ--RMQBATCRSIVKVFVAMA---VRGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	514
ESHARK	LYSA--RMQPCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	503
BHARK	LYSV--RMQPCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	504
XENOPUS	QYSL--RMQSSCKKAVKVFVLSA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	519
STERLET	QYSQ--RMQPCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	508
GAR	QYSQ--RMQPACCRSIVKVFVAMA---VRGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	503
HUMAN	QYSP--RMQVCCRSIVKVFVALA---AKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	499
PLATYPUS	QYSI--RMQSACCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	499
TASDEVIL	QYSI--RMQVCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	500
COELACANTH	QYSQ--RMQPTCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	500
CAECILIAN	QYSV--RMQVCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	505
CANARY	QYTE--RMQPVCCRSIVKVFVLSL---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	495
OSTRICH	QYSE--RMQVCCRSIVKVFVLSL---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	466
GECKO	QYSI--RMQVCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	503
TURTLE	QYSV--RMQVCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	504
ALLIGATOR	RYSE--RMQVCCRSIVKVFVALA---GKGP-VLWSPFSTVYQGLIRC--SKPVLLQSD	464
APLYSIA	RVVK--KLQFVTVYKSLILLLLTLV---DKAA-VFQQLISTVYQGLIRC--SHPVLLQSD	499
TRICHOPLAX	YVIN--ELHSLCYKSLFELLALH---SKGA-ALKNFLSRVYQGLIRC--SHPVLLQSD	495
SOFTCORAL	ELGR--GQPFICLAKMLKFLALT---TRGA-SLKSFLSEIVYQGLIRC--SHPVLLQSD	499
STONYCORAL	ILNK--GGFLCCKALIRVFLHLS---SKGA-ILRNFLSEIVYQGLIRC--SHPVLLQSD	504
SEA ANEMONE	RLSK--SAKYLCHKALVKMLINIS---AKGS-VLKNFLSEIVYQGLIRC--SHPVLLQSD	501
SEA CUCUR	SIPV--RYRFLSHRALFRIFLVH---PKGT-CLQQFLSKVYQGLIRC--SHPVLLQSD	502
LANCELET	RLGK--KMHLCQKALIKVLLALV---PRGA-TLRTFLSRVYQGLIRC--SHPVLLQSD	506
STARFISH	RVPN--KYQYLSHQALILLVLIALS---SKGA-TLKNFLSRVYQGLIRC--SHPVLLQSD	502
SEA URCHIN	HQAR--SSQWTSHALIILLIALS---AKGT-SLQGFLSRVYQGLIRC--SHPVLLQSD	504

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----DGDLYIKTCQEM-SKFYIGIIEQ-KVWT----	527
TETRAHYMENA	-----SMQEVYETLKSC-SQFKSLPNC-QLWT----	541
STYLNCHIA	-----GGESPYESLQDA-VQFREWLNKDKIWS----	527
APHANOMYCESa	GEMLYHP-----DTGLPESRLLFEY-EGLRWGCLKRMQG----	543
APHANOMYCESa	EETLYHP-----DTGLPEPRLLFEY-EILWRNLLKRLKD----	536
PYTHIUM	LMVLYHP-----ETGNIETKLLYEY-EDLVALLRGKKHTYKTK----	547
PLASMOPARA	-AVIYHP-----GTGELVTNLLIYEY-EGFLNFLRLRSERVVGIPI----	546
BREMIA	-VVIYHP-----NTGEFVTNLLFEY-EGFLAAILRLRTEGLVDAT----	545
AEDES	NQGRGPPE-----NSNWKDYITYRNY-LPLRGLLTPGSSL----	532
MIDGE	EEN--LEN-----VRDWKETITYKYL-LPLSRLLSPLDE----	538
BOMBUS	ELQRL-N-----NLSEPRCLCYK-LPLQLLDDQMKYS----	522
ANT	ELOQEL-N-----DLQMPVCYKYL-LPFTCLLAEERYA----	533
WHIPWORM	NEQPVADE-----GYNGRQPTAANH-ASLRKLLAYDIV----	539
TRICHINELLA	ESIVLA-----KDENTPHLAD-LPFLKMLDSEFV----	537
BEEBLE	ELLETS-----SOKVVTIKDY-LNMLKSLKIVPVR----	522
BARNACLE	ELQKDSAV-----SYADRPISYKY-LPLDALLAAHLR----	537
THRIP	EILRDT-----QOKVITYENY-LPFWQLLLDTSN----	500
FLA	FEE--NE-----DFYKNNISYKYL-LPLIGLLSQKDG----	513
WHITEFLY	EFHKSE-----NMEVTSYKY-LPMLSELLRSLKRRH----	525
TICK	EASREDDG-----TSQSRTITYRNY-SFLAYLLNAVAQV----	522
TERMITE	ELQ--KG-----QPHENVFTYKY-LPLKELLSVNN----	522
DAPHNIA	-----LSDSVKYL-TSLITLINFSGQANL----	507
OSTREOCOCCUS	ALYR-----ASPVPMWR-LVELTLLGRVDDTV----	551
STENFOR	SS-----NRFL-ELA-SKLWTGIQOCLAI----	514
KLBSORMIDIUM	P-----DDPKWPL-LPFTCLLQPVVLSAA----	535
CLUBMOSS	P-----ASDFLWKS-CDLQCQIITNISEPSHT----	527
MOSS	E-----GSVQLWRH-VELSHLIDFSSD----	522
LIVERWORT	D-----VGLPLWPH-VELSSLDSLKVSUGE----	532
LIGNANO	SDTEAGSSPGSASDS---AADPVQGDASNSVRKISYKY-LRLWLCFLSLEKEKKL----	543
COPEPOD	QILDP-----DVLTFKYL-VPLNGILQSGNPP----	524
GLOBOSUM	AGMDE-----LVAESREPTWKD-LVFNELTFVAK--NE----	495
PALUSTRIS	VNDG-----QPAAVRPAFDY-LFVQLFKWTSAAEK----	527
NEOCALLIMASTIX	FQKDSNESNEDDMDIDDQPANVINVIDEMAKENEHSYNDYYSFVKVLDKNNLPER----	551
GLOMUS	RSDLQ--NA-----NSKMDIVVAEHTYQEL-FFWENIFKDSSTLSWIIDQ----	555
LOBOSPOR	PSYR--I-----DQITITDQIAHWSYSL-LPLRNIFKPTVLEDLNK----	542
SYNCEPHALASTRUM	NE-----TQVIVE-LAPESIFKYTEAQ----	519
FUNCTIVORUM	---E-----LEQPMY-LSKMISLQVQNERE----	564
HALBUM	PHLNTG-----DTPWYEV-KEVYHLLHPKPSDISIRG----	565
DPURPUREUM	ALITTS-----HTPFYEV-KDLVPLLNPTTESIDKD----	571
PVIOLACEUM	GLITTG-----DTPFYQV-KEVYHLLNPSIDLGDIP----	564
AMPHIPOD	AV-----PASV---PTGGRWFVGADEPVSCAS-FPLRALLCPTAASAVKC----	541
SHRIMP	SPGEGSSWRG--K---AGGGEWGLKNEVVFSSY-IPLTALMVPEKVANIKV----	548
MUDCRAB	LKKE-SELWKESENDS---EESGGWEGFKKEAVTYKYL-LPLKAIMPEKVSYVKI----	548
TARDIGRADE	DGLSSP-----PPAGSMGTKKSFSYKY-LPLNKLGCCTYMK----	550
HYDRA	IISTENL-----SKKDALITIKT-LPYNFLLEKKNYS----	519
SALPINGOBECA	DMAED-----AVAQSY-LALRQLLKGSLV----	539
SPIDER	EAMKDSITTKGE-----DNQKNDNFISASKIITYKY-LTLRMLNVVRFK----	552
LIMULUS	LIMULUS-----VETY-----DPRQITQNY-LSLHALLDIVNSK--L----	538
SCORPION	EARENMSGDN-----LELKY-----NPREITSKSY-SSLRNLLYIVRMK----	538
ROTIFFER	NQEDTSD-----TNEPMSIIVTTSLD-VMLSNFLGLQFS----	538
CIONA	GRDSYVDLTDQVVG-----EDDLNDILLDPRITITYRD-IPLLALLGESEKK----	554
OCTOPUS	MEQPPG-----TGTFRVWSVKKEVSYKY-LSLSNLLKSSSLK----	528
CAPITELLA	QEAKE-N-----V-DEVNLKVDVSYQD-LPMLKALLTAGLKL----	537
LIMPET	EQTDDD-T-----LYNVDEKQISYKSY-LNINLLMSPEIK----	530
SCALLOP	EQTTEESTN-----PQPEGVMRKITYKY-LISLTLGLNSARIK----	538
LINGULA	GEVEAEVD-----MEMQSEKKITIKY-LDFNMLLGSSEHLK----	537
OYSTER	EDMTES-N-----QSEGTGKVTFKD-LIELDITLNSPRIK----	535
SNAIL	DENQEI-S-----TAETDLTVRQITYKY-LLEVNSGLLESGRKIK----	533
SPONGE	VQGDSDAVVT-----A-AAPLADSNKVMYSYLQ-VQLIQLIDYKRLK----	544
PRIAPULA	SSVFSQN-----A-----DDVDDDFQERDPRNITYID-MDMRHLLGSDRKMK----	547
DANTIO	ERGVSSGV-----SQ-----SEDSLVRSGKWKVPSKDY-LLEKGLLDCEMLK----	558
ESHARK	EGTGRSES--GL-QQ-----QSASEVMWTKWVPSYKY-LDLRSLLDGRMK----	549
BHARK	EEMTKAEPWSSA-QQ-----SLSNGMGTGKWRVPSYKY-LLELRSLLDGRMK----	552
XENOPIUS	DG--KEGSEAE--T---AAATGEVVRAGKWKVPTYKY-LDLRNLRLCDQLK----	563
STERLET	EEGG--QGGG--Q---PVEKQVHTGKWKVPSYRD-LDLRNLLECDKMK----	551
GAR	EEGAAQGAEGG--R---SAGAGQVRTGKWKVPSYRD-LDLRSLLDCLMK----	549
HUMAN	GP---ESESE--D---HRASGEVRTGKWKVPTYKY-VDLRHLSSDQMM----	541
PLATYPUS	EAYGRDASESD--D---SSAFGEVVRGKWKVPTYKY-LDLRSLNCDCEM----	545
TASDEVIL	EAFGKEVSESE--E---YPSGGEVTKGKWKVPTCKD-LDLRNLSCDQMK----	546
COELACANTH	EGIGKGLQSEEDAD---PAAPGEVRTGKWKVPSYKY-LDLRNLLECDKMK----	549
CAECILIAN	EGSGKSGPGSE--E---PPVAEEVRIKWKVPTYKY-LDLRSLLDCLMK----	551
CANARY	DFSVKETSGETE--E---AFEAGEVTRQSKLPTYKY-LYLRSLNCDTMR----	541
OSTRICH	EYFGKTSGETE--E---SPAAGEAGKWKVPTYKY-LYLRSLNCDTMR----	512
GECKO	ENSGKTSASE--E---HPASGEVRSKWKVPTYKY-LDLRSLNCDTMR----	549
TURTLE	EITGKVSLE--E---STFAEVRGKWKVPTYKY-LDLRSLNCDTMR----	550
ALLIGATOR	EFDGKASKSE--E---PPAVGEVRTGKWKVPTYRD-LDLRSLNCDAMK----	510
APLYSIA	SQSEDR-----LGMDDVPGANKVPTYKY-VPLLGLMDSERIK----	537
TRICHOPLAX	DSDLNI-----SQDSVILETGPRISYKY-LSLKNLIQATEIK----	533
SOFTCORAL	GVDAM-----EGVTEFDRHISYKY-LLENECLFDGGQYK----	534
STONYCORAL	VNGESTIM-----EEREVEGTPNTSLKDY-LLEWYLLDKDKLK----	544
SEA_ANEMONE	GPDVVKQGVV-TGS-----RSDQVTFKY-LPLHEMLDKTKFK----	539
SEACUKE	AGVKDN-----QG-----TGGEEDDEVANRMTYKSY-LDLASLLDSQYLYK----	544
LANCELET	VTAEDIDLVA-SGE-----EGGEQQPPVPRFSYRD-LLEGNLLDSRLK----	554
STARFISH	SPSID--HPVL-GND---DQDTEADILADARHITYKY-VKLLASLLDSTHVK----	548
SEA_URCHIN	GGD-----E-GEE-----QRSDEMEIEQDSRRVSYKSY-MDLNTRLLDSEKTRIK----	545

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYL, EXPANDED

PARAMECIUM	-----OHYLTKFKVQKLPDQIAQLIQNCN	550
TETRAHYMENA	-----DETLEHFSAQFPQYIQLLENTD	564
STYLOMCHIA	-----EYTCQVVYVYQELIQRVIRIISDLN	550
APHANOMYCESa	-----EELQAMVAMADMTLITLQRLD	566
APHANOMYCESe	-----QKNHGKIIDVPMKSIIEVFERLD	559
PYTHIUM	REV---TPHT---S---SDT-RSEDTTITAIRGMLDLSLFKSVQAVVGGLN	589
PLASMOPARA	CIP-----TEAG---S---GDVQRIELKFKDRTLQAIILSDTVKHVLAIIIRKLN	589
BREMIA	PMP-----VETS---N---IDVPMGDHKNTRTLQAIIFDSTVKHVLDIISQLD	588
AEDES	-----SL-----DRGPLIKVIVYQMLKTLFLILDKLD	559
MIDGE	-----NHEEISSLVYMHFINNLFKIVESLD	563
BOMBUS	-----KDFKY---SRETQVIVDSTMHVGLALDKML	551
ANT	-----NEQ-----LAQLVANTMDVYITLIDRLM	557
WHIPWORM	-----DMSDFGYDSSTQKLEEVFVYVMWRMLIELIQTVK	574
TRICHINELLA	-----DLSEFGFDRAMQVNIQRPLDFCFMKSFLIEIVRLLS	572
BEEBLE	-----RFDKFRIFLQERKYIIVLVKIDKLMRLLILINKLN	557
BARNACLE	-----QLTRKGVSAALQALANEVFAALVDASQKIISELD	572
THRIP	-----KRLLEASIEEKRDISRALVSKILDSVQDIINRDL	535
FLEA	-----VQKELSLRIVYDNIIMKAPPAINKLD	538
WHITEFLY	-----SIEPTIP-ECEAARIRKLLYRHLIDSALLVIDRDL	559
TICK	-----ELNMQIISLDARQMLVRDVYDGLLSALSIVSKLN	557
TERMITE	-----FQKRSTLSQTQLIVVYVYKLVNTVLVLMKKLD	556
DAPHNIA	-----PFSLERAYVSAIIEQLVSAVSTIISRLD	537
OSTREOCOCCUS	-----SRYSLESDRDIQIATAAVYGSFVELLNFCITML	585
STENTOR	-----IL-----DMQEIIGSFPY---HQISTLE	535
KLEBSORMIDIUM	-----QNPREEASS-EA-DSETPVASRISVNAADYAMRELVYDSLVQNMLTIVGGLD	587
CLUBMOSS	-----ENLQDD-----DGIVGVDLAVLNVNVDLKTITPDSLIRSIIMKLMELN	571
MOSS	-----OGLQLEAGLD-EAESFEELVTSVDGNVGIIESSLESYDIAMHCIVKMNELN	575
LIVERWORT	-----QGAVPVAETD-DEHMSGEL---LLGNGTDTVTEIQGLVFDITVRSIMKALTELN	582
LIGNANO	-----CDYVGMSAEARSISGGIFDAFLSSVLAIERLD	577
COPEPOD	-----S-----RSRILDSFLRSIFLIVDKLD	545
GLOBOSUM	-----AWDESKVHDFRSLLYDGMVTALILEPGNLN	525
PALUSTRIS	-----RLDSEDRKKLDMLVDETMKALIQLPQNLN	557
NEOCALLIMASTIX	NEPKM-----EDDTLVEDENKRNQFIQKLYDII IQTLIDFPKHLN	591
GLOMUS	SGFLI-----DENRL---NTIQLEFFSILYDEFISSVFKMIRTLN	592
LOBOSPOR	TRIDI-----S-----GEDLERFLCVVYGTMESFKRILILLN	575
SYNCEPHALASTRUM	-----P-----SDLEDQFLGLLYDSFLTALLRLKLFM	547
FUNCTIONIVORUM	ASSAS-----SAYQSFKAEKESKVFVYSLMGCMILFPQVE	604
HALBUM	IOMEVEQHVQVKQEKEKEK---EKEKDSISISTSEDIQQLLYNEIVQMTITIRKLD	622
DPURPURUM	LASSSKPQQQNNSSAINNDKHNIIIVTVKKEIQAQIIPKLVYNEIISSILVVIKGLD	631
PVIOLACEUM	EAFRL-----KSNIQEVENTSIRKLIYDEMISILSLDKLD	601
AMPHIPOD	SVLSV-----T-CVTEVAVSRRSAVCSALTEFSSAADLILGQLD	580
SHRIMP	SGMPA-----T-VMTEM-----SNFIYSEFISCIIEISEKLD	579
MUDCRAB	PGVST-----T-ILTEI-----SSKLYSEYITSTIEIAEKLD	579
TARDIGRADE	-ELH-----ASEVELQRTSKLIFDEFIKATIKMIDAMN	586
HYDRA	-ISVY-----SRSELCAVKELLYDCILSAFNLVNLKLN	552
SALPINGOECA	-KIPD-----E-----EMTHEDRNAMRLTYDETLKAFHLINKLN	574
SPIDER	-ELNS-----L-----NIPLERQYLMBCIYDEIIRSSLNLINKLD	587
LIMULUS	PEVGT-----L-----QVPLAERQSLAENVYDEI IQAVFAVLKLD	574
SCORPION	-ELNH-----L-----GILSEDRHNLQLIYDEIISVVTLKLD	573
ROTIFER	-DLKS-----D-----NLDKIKVIEIIFNEYESLIKMKLD	571
CIONA	-FVPY-----AVND-ILMCGHRKVCHEMYTAAFKAIVAIVDKLN	592
OCTOPUS	-ELST-----V-----GYFSRDREKLTQLLYDEIITSVIHIIEESLD	563
CAPITELLA	-ALGO-----Y-----NITABQHRVLAASAIYDELSSAMLKMSRLD	572
LIMPET	-VVLF-----E-----SFALFILQTLTDALYNELMNSVIKVLNKLD	565
SCALLOP	-DFSV-----A-----DISLDRHRLTEVLYDEL IACVLKILCKLD	573
LINGULA	-VH-----S-----KLTPEKSALTAQIYDELVRSKTLILSKLD	570
OYSTER	-EFSV-----A-----DISVEVRLALTEAVYDELINSVRLMKGKLD	570
SNAIL	-DLIQ-----D-----GIGAERDQLTHAVYNEMLQAILKVISKLD	568
SPONGE	-GMGM-----D-----FDLELRQSIHQVLVYSEFTQSLNLILRKL	578
PRIAPULA	-GLNE-----L-----GVSMSTRKALTCVYDEIIVTSLMKIVGKLD	582
DANTO	-DTGF-----V-DGAPAARNYNLRDLNRHLYDALVQSVMKIVEKLD	597
ESHARK	-EFGI-----V-DTLQIMNPLQSLNRLLYDEL IKSILKIIIEKLD	587
BHARK	-ESGL-----IYFTFQMFDSPLKSLNRLLYDEL IKSIVLKIIEKLD	591
XENOPUS	-DSIF-----SDEIFSTVNSPLQSLNRLLYDEL IKSILKIIIEKLD	602
STERLET	-DTGF-----V-DGAFDVRSSSLHSLNRLLYDEL IKSILKIIIEKLD	590
GAR	-DFGF-----L-EGVFESQAPLQSLNRLLYDEL IKSILKIIIEKLD	588
HUMAN	-DSIL-----ADEAFFSVNSSESLSNHLLYDEFVKSIVLKIIEKLD	580
PLATYPUS	-DSQL-----DETFLIVNSPLQSLNRLLYDEL IKSIVLKIIEKLD	583
TASDEVIL	-DSL-----ADEFTLLVNSPLQSLNRLLYDEL IKSILKIIIEKLD	585
COELACANTH	-QSAL-----VDETFGVNSPLQSLNRLLYDEL IKSILKIIIEKLD	588
CAECILIAN	-ESIF-----SDEVF-SVNSPLQSLNRLLYDEL IKSIVLKIIEKLD	589
CANARY	-ESVF-----EDANFLTEKALQSLSRVLYDEL IKSIVLKIIEKLD	580
OSTRICH	-ESVL-----EDENFLAANSALKSLSRLLYDEL IKSIVLKIIEKLD	551
GECKO	-DSLL-----ADENFLMANSPLQSLSRLLYDEL IKSILKIIIEKLE	588
TURTLE	-ESVL-----ADFTLLANSPLQSLNRLLYDEL IKSILKIIIEKLD	589
ALLIGATOR	-ESVF-----ADENFLTVNSPLQSLNRLLYDEL IKSILKIIIEKLD	549
APLYSIA	-DLAA-----E-----DFTLADRRELTKAVYSQMLAALMKILRKL	572
TRICHOPLAX	-GLTL-----I-----TTDREHIIYVQSRLYNELLHSLQRLILKLD	568
SOFTCORAL	-DQSI-----M-----PKVSSLTQDIIHRAIYDEL IQAALKVAHKLN	569
STONYCORAL	-DESL-----L-----GKQLEERKVMHGLVYDEMIIGILRIIHKLD	579
SEA ANEMONE	-MYLL-----FQSLSLSDIEKRESLHELIVYDELVGAALRIIHKLD	578
SEACUKE	-EIDA-----M-----GMTYVERKKIHATLVNEMMSMMKILTKLD	579
LANCELET	-ELSQ-----W-----GVAVADRQAMHRMLYDELVTSVLKIIVDKLD	589
STARFISH	-EVQA-----M-----GMNYADRRKIHIILYDEL IFSILKILSKLD	583
SEA_URCHIN	-TSEA-----H-----GSSYAERLANIHTMIYNELIGGILKILRKL	580

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	FESIQKEVNIIDEQNIQQQ-----	568
TETRAHYMENA	LSYKVVVYVQIIEDEILKDKN-----QMBIEQDKESKIQ-----D	598
STYLNCHIA	ITYYKVERGRNNKDNQD-----ESNNNNRGRDPQILNQELT	587
APHANOMYCEsa	LRVQLEADTAE-----	577
APHANOMYCEse	LRVQKQENKTE-----	570
PYTHIUM	LAYQYLDQDGA-----	600
PLASMOPARA	LSYQFDSQTTKI-----	601
BREMIA	LSYQFDLHATNN-----	600
AEDES	LSTRKRTV---RDD-----SGE-DQD	576
MIDGE	LSTKRRKF---YDE-----SNMVEKE	581
BOMBUS	LCT-KTKE-----D	559
ANT	LNVKRTNE-----D	566
WHIPWORM	LNAKTVE-----DASPE	587
TRICHINELLA	FETKAFQD-----VEEYT	585
BEEBLE	VSVTLNDN-----S	566
BARNACLE	LSTQPLDG-----DAP	583
THRIP	LSLQENNS-----SES	546
FLEA	LSTKRRVK-----NKSNDDD	553
WHITEFLY	LSTVRKED-----DENQ	571
TICK	LSVRQOAS-----SDDGEAR	572
TERMITE	LSTRKKTNIHALSTS-----GGASEAD	578
DAPHNIA	LSTSEENSSEDE-----	549
OSTREOCOCCUS	LGIIVTSGLSTSLQDD-----EVDVA	607
STENTOR	LSYSIN-----	541
KLEBSORMIDIUM	LRVDVRAPSKEAAPSEED-----EGKTSED	613
CLUBMOSS	LKYRVKDLANKANS-----EFSG	589
MOSS	LKYRVKPARTG-KYSEE-----LDAGP	596
LIVERWORT	LKYRVRASNLSTAQEE-----ADSSL	604
LIGNANO	LSACRLSDLEPPVTAASEASS-----SSA---TTDEDSA	608
COPEPOD	LTVVHDGEDEVQPEPEEQSM-EI-----SL---TQSDV---DAVRVSP	581
GLOBOSUM	LSVRETPGDS-----DASTV	540
PALUSTRIS	LSLTVNQA-----	567
NEOCALLIMASTIX	LALYDEINNNGRINDNANSNTDN---EMEENVITITSTMRSGENNN---EIIENK	640
GLOMUS	LAVTEASDVSLGTSITKNDHEV-----D-ANLIA	621
LOBOSPOR	LTVSESETD-LE-EGVDADIKV-----IDV-----D-----PMSVSTV	606
SYNCEPHALASTRUM	LELTSBAAPDAELHMPRRSRTGI-----ADE-----K---DT---RV	578
FUNCTIVORUM	LSIDKMGGE-----	615
HALBUM	LSYSTKEEERQEKELKQQVKDKDGEEKEE-EEEQEEDVT---MEDQQD	676
DURPURUM	LQYSKDTASDSQK-----S-K---DEEEKD-----ISI	659
PVIOLACEUM	LQYSKKEELNNNNNNNSQ---KDKDLIDQLEEE-E---EDENNAT-----IKT	645
AMPHIPOD	LSTQQQQQQEDELPPQ-----A-----LDATDEN	605
SHRIMP	LTTYKQNELQQQE---E-----V-----SGSDEGD	601
MUDCRAB	LSTFKQEIETND-----ITSDDGD	599
TARDIGRADE	LQLETESEDDRVT-----	600
HYDRA	FVTENKAE-----KLR	564
SALPINGOECA	LTHSSDAEDEDVA---VATSGVK-----EEEPHEV	603
SPIDER	LSLQQPEFYGKEDD---N-----ES	604
LIMULUS	LSSSENTVDSVEVAD---QLS-----	592
SCORPION	LATTSHMQDSSEIKDS---NLKQ-----FETSELY	599
ROTIFFER	LAAYKNDGSEVNGE---QENV-----DRKQSDL	597
CLIONA	LEPSAENKEVIEIEN-----	605
OCTOPUS	LTIINTSISQDVVIQP-----SAST-----ISPMDSP	589
CAPITELLA	LSSNSTDSESQPST-----SEPALS	592
LIMPET	LSTSTTELTEQDME---ASTSGG-----DVTMETD	593
SCALLOP	LSTSTSELSSQSDQ---NSKAGAS---GEGLEEG	602
LINGULA	LTSVRGSEDTDQGS---AGT-ADK---GRPVTPF	598
OYSTER	LTSQSSTEVAQQQEG---PTS---SNESE	593
SNAIL	LSTSTQRESE---TSG---TEE---EKSDI	589
SPONGE	FVTASTTEDGIMANESEGGG---GSGGDP	605
PRIAPULA	LSTSKSTDPQVHDGSGGAS---SESPDAY	609
DANTO	LSVKVSADEVQ-S---D-ASAGI	617
ESHARK	LSVEKQKREESGSG---DVSNQNV	609
BHARK	LSVDKOSONEEGSGG---DVNSSIV	613
XENOPUS	LSLQKDTGQE-DDG---GINLLI	623
STERLET	LSVQKSADEQEGRS---DASSML	612
GAR	LSVKQNFDELE-ES---DVSSGVV	609
HUMAN	LTLTIQTVEQENGD---EAPGVWM	602
PLATYPUS	LNVEKQNTGEX-DES---EVSNLWV	604
TASDEVIL	LKLEKQVGNQEDS---EASGVVV	607
COELACANTH	LNVRQKRVGDQEGET---DPSSSTII	610
CAECILIAN	LTVKQVSGEQDAS---DEDSALV	611
CANARY	LTVOKLDISEQ-DGN---AGDSALV	601
OSTRICH	LTVOKLNVNEQ-DED---EFTSALV	572
GECKO	LTVOKRVNDKADAN---EADADLT	610
TURTLE	LTVOKLNVSEQ-DEN---EAGSDLV	610
ALLIGATOR	LTVOKLTFSEQ-AES---ESGDVMI	570
APLYSIA	LEATVADSALLEGDAE---MEERE	592
TRICHOPLAX	LTSQQTTIEETE---QSS	584
SOFTCORAL	LSSFRDVTQDEDLQTE---QPSSPD---APLLTTS	599
STONYCORAL	LSSKSGSAQEGDILGKSASDVPA---SATADKE	611
SEA ANEMONE	LSTTKHGQDL-Q---VRD---QPQEQE	600
SEACUKE	LSATKSAQEGE-IQGE---VSN---ADTNTSL	604
LANCELET	LTTSKQVETGN-EE---LTA---DVSGSQD	612
STARFISH	LTSNKDTTELQ---D---QVA---VSDSSTE	605
SEA_URCHIN	LSSNKHEEA-ST---SGG---VTSLEG	603

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	----NLLNLVLKIRKYPKALLLLIPARVLL----KYIKETQLINQ-----	651
TETRAHYMENA	----QFYKSIILKLRKLPRLVLLKLRCLN----EYIEKNNILKG-----	681
STYLNONCHIA	----QFTDTLKKASQTPRIKLLKLLKVCMQICSNHRYFEVSDIDS-----	676
APHANOMYCESa	----LVVQWMLPSARQLPLVSAFVRLATVISHLLANSAA---S-R-----	656
APHANOMYCESa	----LFLKWIIFSRRESPLVSVLRLATVTVSRILAIEVVS-----	645
PYTHIUM	----ILLMLVIEKSDDELPLVSGFVIRVRLTVSKETKYFDMERDIT-----	684
PLASMOPIARA	----LIMNQIFASICDLPLVSCFVRICTVMTKAMHELNYFKSASS-V-----	685
BREMIJA	----LIVEQIISLAAKAPLVSCFVRICTVVAAMNGLVYFESPAT-L-----	684
AEDDES	----IFYDYVVRKSVKHPVLSGFKLIDGLFTANQLQYQFINFIPLO-----	667
MIDGE	----MMLENSIKLSFKHPVLSGFKLILETALKVINRNLAVTN-----	667
BOMBUS	----KFLLKVISKSHKMLVSGFKLVHAIKSHKICELSSDBE-----	641
ANT	----RLVEYVRLSYKPLISGFKLIRVCMKFAHLEEBEKTEEBE-----	655
WHIPWORM	----PFFSVLVKRTIENLNVSGFKLLSYCIAAAEKSLFDVSISE-----	674
TRICHOINELLA	----PMLTMLLELSSRYPMVSGFKLLAWVWMAEKLNYPNTEQD-----	672
BEEFLE	----KLIHYLAKCEKHLLISGFKLLSFCLKICKDINYPNSSC-----	651
BARNACLE	----LISQVAVTSVQRPLVSGVRLRLARIYLLTAGRLGCWQAVQEN-----	671
THRIP	----PLLILYKICLSSKHPVLSGFKLLANIVRIAENLDYFBEQKDE-----	634
FLEA	----TYLKEVINCSYKFPVIAAGFKLSSYGLDFCDICEYFDHYEES-----	622
WHITEFLY	----RFGRSIIDFSVRFPLVSGFKLIATLQIADKQYFKTETTS-----	658
TICK	----VVVQMVESARHPVLSGFKVVAASIGICEKSSYFEPQS-----	657
TERMITE	----PFFYKVISSSNKPLVSGFKLLTVALQLCDRLHYFSDYGD-----	665
DAPHNIA	----PLGEAVIGLSMKFPLIPHLVRLIATLLSIIIGQVLPV-----	627
OSTREOCOCCUS	----HLSDELMRMANQNSLSGFKLIGAVISAANRGGYFSLNLSKAE-----	695
STENTOR	----PILILSKKITLPLPLSLIIFKVSFQIIVSNVNSDQLQ-----	620
KLBSORMIDIUM	----TFCRNVIALSDQPLISGFKLLAVAIRVGDALYFAEETSAAEP-----	703
CLUBMOSS	----PFCRCLIDLRSKYPVLSGFKLLAAVVISIGDQKGFPEKQDS-----	674
MOSS	----PFGRCIIELSNRYPLISGFKLLTVNITIANREGFLSVAGEDSLD-----	686
LIVERWORT	----PFCSCVMELSHQYPLISGFKLLTITITIGADSIGFQSKDLCKVS-----	694
LIGNANO	----PLCQALIEKSAENPLISGFKLLATFVTRADAGYFNDQPVVVM-----	698
COPEPOD	----RLWYKISVMAYEHDVSGFKLIPANKLELD-PVKYIE-----	661
GLOBOSUM	----VVGQKFIYSYTONPLVSGFKLIFGVVLLALSDSLKYSVPTRNE-Q-----	629
PALUSTRIS	----IVGNKWIELSLKPMVSGFKLVSVILRLSKSTGPFEGALAPD-R-----	656
NEOCALLIMASTIX	----SPGKEIISFSGKYPVLSGFKLFECLLISEDLQYFNILKKE-Y-----	730
GLOMUS	----LAGDTLITFSTRYPVLSGFKMLGSLTVCSIKFDPGKIRVND-----	710
LOBOSPOR	----VIGSTLIELSKHPVLSGFKMFMATCLQVCQSIISLFPQKQSLM-E-----	695
SYNCEPHALASTRUM	----IAGSELIQLSVRQPLVSGFKMLSTIATIDRRTGCFQESQKLY-H-----	667
FUNKIVORUM	----LAKELILKSHQCPVLSGFKLFTLLANASREHAYSTTDP-DM-----	701
HALBUM	----IFGKEIIFGSRKYPVLSGFKLLHVLKAKVKNYGPIDG-SNKS-SS-LD-----	770
DUPURPUREUM	----IFGKEMINYSKYPVLSGFKLQIVMKICKSOKYPTNTHI-EIIF-QF-IL-----	753
PVIOLACEUM	----ILIGKDMIFNSKRYPLISGFKMLIQVMEVTKKESYFYSIQD-NEK-----	734
AMPHIPOD	CEAAVTSAFCVVAREIPVLSGFKLALLTVLLRYLHAHQWQRQD-----	704
SHRIMP	----RLVWFVVTQSSLPVLSAHVNTATVLTCSRQTFQFSRQD-----	687
MUDCRAB	----RLCWFFIRCSSEQLPVLSAHVNTATVLTCSRQTFQFSRQD-----	685
TARDIGRADE	----QFCQLIMKLSKPNVLSGFKLLEVWFRRLRSKPEHDKMLKDRQTDLSPLSAE-----	697
HYDRA	----IFVEETLKFMSKLPVLSGFKLRLHSLVSEQIGYFEANNH-S-----	651
SALPINGOBECA	----IYSDIVTRSSKYPVLSGLKLELANTIATEQRYFEAASK-T-----	690
SPIDER	----VFGKEMIFVAVKYPVLSGFKLISMLNSICSKIGYFKTLSS-N-----	691
LIMULUS	----TFGMEIIEHATRSRPSVSGFKLAAVCLKICSRKIKYFKMINT-L-----	679
SCORPION	----IFGLEIIQFINRMPVLSGFKLITVCLTICKTRAFQVYKVK-L-----	686
ROTIIFER	----KLSKEIILLSTSHLISGFKLALTLIMKNAVKIKYFNKIDS-I-----	684
CLIONA	----DLICFMVKESEKYPVLSGFKLISLMLISIKLYPEDEHE-V-----	692
OCTOPUS	----RYCNLVKLISTSTPLVSGFKLRLTVMCKIARDLHYFEGISID-----	676
CAPITTELLA	----PFGHOLLQSSKLPVLSGLKMLTVMCMQVSAQISYFKEMNR-QL-----KI-ET-----	684
LIMPET	----TFSHNIIILLSTQNPVLSGFKLLALCMKISNKLAYFOVNES-N-----	680
SCALLOP	----TFCHKVILCSTDNPLVSGFKLLAMSMKISNKLNFVKMLY-LD-----VM-GT-----	694
LINGULA	----TFGHQLIVMSTKYPVLSGFKLLAICMHATRTAYFKDISL-S-----	685
OYSTER	----LFSHTLILQSTTEKPLVSGFKLLAVSMKIANKLNYPQMGVS-L-----	680
SNAIL	----TFHTVVVQSTTEFPLVSGFKLLAVTMKIANKLEYFKDIAV-E-----	676
SPONGE	----TFSQEVSLATRYPLVSGFKLLTVCLSI CNKTHFFDVIDL-S-----	692
PRIAPULA	----TYGHEVILLSTRWPVLSGLKLLTVCLSI CSSLQYFKAMRK-V-----	696
DANTO	----PLCHELILQSTRIRPLVSGFKLLSLSMGIARKTQYFQDVQV-C-----	704
ESHARK	----RFGYELILRSTQPLVSGFKLLSVMKIARKIKYFEGVSP-K-----	696
BHARK	----RFGHELILRSTQPLVSGFKLLSVMTKIARKIKYFEGVSP-K-----	699
XENOPUS	----VFGYELVQSTRPLVLSGFKLLSVMKNAKRSRYFEGFTS-K-----	710
STERLET	----GLGHELILQSTRPLVSGFKLLSVMKIARKIKYFQGVSP-R-----	699
GAR	----PLGHEIILQSTRPLVSGFKLLSVMKIARKIKYFQGVSP-K-----	696
HUMAN	----SFGYELILQSTRPLVLSGFKLLSITVRNAKIKYFEGVSP-K-----	689
PLATYPUS	----SFGYELILQSTRPLVLSGFKLLSIAIRNAKMKYFEGVSP-R-----	691
TASDEVIL	----SFGYELILQSTRPLVLSGFKLLSIAIRNAKMLKRYFEGVSP-K-----	694
COELACANTH	----GFGHEVILQSTRPLVLSGFKLLSVMKIARKIKYFEGVSS-K-----	697
CAECILIAN	----TFGYELILQSTRPLVLSGFKLLSVMKNAKRTKYFEGVSP-K-----	698
CANARY	----SFGYELIVHSTRPLVLSGFKLLSVMTKIARKIKYFEDISP-R-----	688
OSTRICH	----SFGYELIHSSTRPLVLSGFKLLSVMKIARKIKYFEGVSP-K-----	659
GECKO	----SFGYELILQSTRSPVLSGFKLLSIAKIKYFEGVSP-K-----	697
TURTLE	----SFGYELILQSTRPLVLSGFKLLSVMKIARKIKYFEGVSP-K-----	697
ALLIGATOR	----SFGYELILQSTRPLVLSGFKLLSVMKIARKIKYFEDVSP-G-----	657
APLYSIA	----TFAHTLVVMSTRHPVLSGFKLLSVMITLADKLSYFKAFDS-Q-----	679
TRICHOPLAX	----PFGKMLVLLSTRPLVLSGFKLLEIMTIISSLSYFEDLNI-E-----	671
SOFTCORAL	----TFGKELVVLARSFPLVSGFKLLDIVMKISRKLDYFKGMTL-K-----	686
STONYCORAL	----MFCRDIIMSSRFPVSGFKLLEVCMKCKELSFKNKA-E-----	698
SEA ANEMONE	----VFGDRDIVSSRFPVSGFKLLEVCMKICKRLRFQYEVY-TA-----	687
SEACUCUKE	----QFGHOLLQSTRPLVLSGFKLLTACMVICQRTKYFKPGK-A-----	691
LANCELET	----TVGHALILHSTRPLVLSGFKLLSVMCMICTKRYFKDLDT-K-----	699
STARFISH	----RFGHEVILLSCRPLVLSGFKLLTVMCMICTQIQFFKCIK-P-S-----	692
SEA_URCHIN	----RFGHELILQSSQLPVLSGFKLLTICMTMSRRTAFKVEVNP-N-----	690

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----Q-----	652
TETRAHYMENA	-----L-----	682
STYLNCHIA	-----V-----	677
APHANOMYCESe	-----	656
APHANOMYCESe	-----	645
PYTHIUM	-----	684
PLASMOPARA	-----	685
BREMIA	-----	684
AEDES	-----R-----	668
MIDGE	-----	667
BOMBUS	-----	641
ANT	-----E-----	656
WHIPWORM	-----	674
TRICHINELLA	-----	672
BEEBLE	-----	651
BARNACLE	-----S-----	672
THRIP	-----M-----	635
FLEA	-----	622
WHITEFLY	-----T-----	659
TICK	-----	657
TERMITE	-----L-----	666
DAPHNIA	-----	627
OSTREOCOCCUS	-----	695
STENTOR	-----	620
KLEBSORMIDIUM	-----D---ADGDVPMSEASPFLGVPPGDREQCTELFRKFLREVLVAKTHSLLPAGEIASP	756
CLUMBOSS	-----	674
MOSS	-----A-D-----GG-YM-----NLDKKRDSTTFAG----	705
LIVERWORT	-----G---HDAEMVTEEE-WK-----VLLRAPKQLEPOR-----	722
LIGNANO	-----E-IADTNTMESDNQ-----DSQ--TDNDEEG-----	721
COPEPOD	-----	661
GLOBOSUM	-----GM-D--YDSV-E-----	637
PALUSTRIS	-----KE-I--YEGT-EED-----	666
NEOCALLIMASTIX	-----IGES--HKGM-INE-----	741
GLOMUS	-----ENIM--IQDS-QDQ-----	721
LOBOSPOR	-----RI--KIE-DDT-----	703
SYNCEPHALASTRUM	-----EQ--HEG-INA-----	675
FUNGIIVORUM	-----	701
HALBUM	-----ANG---GEDDSMEIDSG-----K-----S-----	786
DPURPUREUM	-----SNKENKLENDLMEIEN-----N-----N-----	772
PVIOLACEUM	-----DLDENNTADT-----M-----I-----	747
AMPHIPOD	-----	704
SHRIMP	-----	687
MUDCRAB	-----	685
TARDIGRADE	ASENQDLDEAEVKMEVDDD-----A-----	717
HYDRA	-----	651
SALPINGOECA	-----AETA-----	694
SPIDER	-----TEE---MS-QEFSN-----	701
LIMULUS	-----LRPKE---CESMQVDD-----	692
SCORPION	-----KTKEE---IS-M-----	694
ROTIIFER	-----QTNLWTSDDSDVHLIED-----CDD--PDSS-MY-----	710
CLONA	-----AEESEMHDGI-----R-----	703
OCTOPUS	-----NLKIT-----ED-----	683
CAPITELLA	-----SD---SIRMEMDEE-----F-----	696
LIMPET	-----	680
SCALLOP	GSPNKS---ADFMDVDQDQ-----V-----	710
LINGULA	-----RDQD---GENSMIVEE-----K-----	700
OYSTER	-----SPVKK---EVKMEVDS-----Q-----	695
SNAIL	-----NSFKK---EEQMDVDET-----G-----	691
SPONGE	-----GQGTG---DDVA-----	702
PRIAPULA	-----NDSQLH---SEAMETDS-----	710
DANTO	-----P--KQV-----	708
ESHARK	-----TWKQC-----	701
BHARK	-----TRKQC-----	704
XENOPUS	-----IYKKA-----	715
STERLET	-----SCKTS-----	704
GAR	-----SFQPN-----	701
HUMAN	-----SLKHS-----	694
PLATYPUS	-----SLKKS-----	696
TASDEVIL	-----SHKKS-----	699
COELACANTH	-----SCKQN-----	702
CAECILIAN	-----SHKCC-----	703
CANARY	-----SLRRC-----	693
OSTRICH	-----SLRKC-----	664
GECKO	-----SKKCC-----	702
TURTLE	-----SYQK-----	702
ALLIGATOR	-----TQKKY-----	662
APLYSIA	-----SQSPRL---EESMDIGEG-----G-----	696
TRICHOPLAX	-----TVTKCTINAAA-----	682
SOFTCORAL	-----DVSTGCV---DDMETD-----	699
STONYCORAL	-----KPDLK---NENLN-----	708
SEA_ANEMONE	-----D-----DME-----	691
SEACUKE	-----DLDES---RGTMEVD-----PH-----	705
LANCELET	-----LLSFS---EESMDTEG-----	712
STARFISH	-----DLSSQ---EDSMDIDL-----NFS-SS-----	710
SEA_URCHIN	-----VTFRTEVNEEPEMDVDDD-----SES--IATR-TT-----	717

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	--FFEARQK-QILINLILK--KGL-----IQNHLKS-Y-SGSLQIETINLLITIPVEF	699
TETRAHYMENA	---KKYIK-KDITSQIKI--FSE-----LYKNLKGK-QDELLIDCLKTMLSIPFEV	727
SYLONCHIA	---A-KKGEK-QNTYNNMLLT--FKE-----LIGKQEE-Y-ODELLISCLDLLLHVPOI	723
APHANOMYCESa	---SPLLS-DALASDYAA--VVQ-----VSKAMPO-Y-HDELLINLNVFVVAIPVSM	701
APHANOMYCESa	-----IP-PAVQDEYID--ILG-----VVMAMKAY-SNELLVSTIFVLAATPLSM	687
PYTHIUM	---DGGSD-VRVRRKYFI--AKR-----VIQGIIFY-KDELLIVASGCVLAAPLGL	729
PLASMOPARA	---DTTEQ--TRFRNDFTSC-VQQ-----VSSQARFY-ODELLIRISEFVLTAAPLGL	730
BREMIA	---TTT--RQFRDKFTS--IEQ-----VTAQAQFY-ODELLIRISEFVLTAAPLGL	727
AEDDES	---QQNFS--MSTTNLLVY--LEL-----QIAKSRNS-TDELLIQLRFRVLGAPVTL	714
MIDGE	---ATDFDM--TKIEESLSPYIKSM-----LISRCQL--SDELLIQHRLRVFVQVPIDI	714
BOMBUS	---I-E--TEFLMLNK--IMN-----VLNLIPTP--SDELLITQVHLLIDVPMPLY	683
ANT	---EKSLES-QQMEELISN--LWH-----SLDLIPG--SDELLINLTYLLDAPFVH	702
WHIPWORM	---NQVGD--ATCRILLSS--VDE-----IFPRSHS--SDELLISVPTFRVVCVRSAT	720
TRICHINELLA	---KTENCN-SHYKLLSD--IDH-----VLVESCRR--QDELLVSRFRLLALPTCI	718
BEEFLE	---ED--ED--TMCYLLTRK--LTS-----LLNKTRQ--TDELLINLQVLLQYPIVI	694
BARNACLE	---D--SAE--AGLRRLLWAH--VSE-----TAPRCSOY-RDELLIQVNSMVLAAAPAL	716
THRIP	---ED--LEW--RSTVNLLSA--LYD-----VISRQAOY-RDELLIQVNSMVLAAAPAL	680
FLEA	---E--E--E--SSCYVLLVNLN--LQE-----CAVNVRMF--NDELLIQVNSMVLAAAPAL	665
WHITEFLY	---T--IEA--ENFRLLVQS--LEL-----VLNRALQY-TDELLIQVNSMVLAAAPAL	703
TICK	---GEA--VACLRLVSL--LRD-----VLGRLOQY-KDELLISGLVLCGLPLAL	700
TERMITE	---NQPTQ--KASYSLLCR--LQE-----LLIRLQOY-KNDLVSNLCTVIAAPVAL	712
DAPHNIA	-----QHPRYQS--MTS-----LINRLSQ--SDVLVSNVQAVLSSTPWL	665
OSTREOCOCCUS	-----S--ERVLSLFSQ--LRD-----VLQDTRR--QDELLIQLRFRVLGAPVTL	736
STENTOR	-----SKSTLGLM--LKF-----VFKKQGS--QDELLISGLVLCGLPLAL	658
KLEBSORMIDIUM	FPGVPPGDR--EQCTELFRK--LRE-----VLVAVSR--KDELLISGLVLCGLPLAL	805
CLUMBOSS	-----SHVMIQE--LHE-----VLITSR--KLHLLSGLHCLSCPPTL	712
MOSS	TTGVLEEDR--RLCKELFRK--LQE-----VLVAVSR--KLHLLSGLHCLSCPPTL	754
LIVERWORT	GLPVSEHQ--RLCQQLFRH--LQE-----VLVAVSR--KLHLLSGLHCLSCPPTL	771
LIGNANO	QSVVAMEN--IQCCAMLGS--AAS-----LSARCGOY-RDELLISGLVLCGLPLAL	770
COPEPOD	-----PDTDLFTLLO--LQE-----HLQKSL--DOVELLISGLVLCGLPLAL	704
GLOBOSUM	---ESSDVT--KAARSLFSK--LDE-----VLLKMQY-KDELLISGLVLCGLPLAL	683
PALUSTRIS	FAEQATSEQ--RRTYILFFNY--IRE-----VLVRLQY-KDELLISGLVLCGLPLAL	715
NEOCALLIMASTIX	INEPYTGIR--QRTYILYTK--INE-----LISRMTOY-KDELLISGLVLCGLPLAL	790
GLOMUS	LSTAASPTQ--RASVFLFK--FDE-----VSARLPOY-KDELLISGLVLCGLPLAL	770
LOBOSPOR	I-----DI--HRAAALFKK--IYE-----VLARLEQY-KDELLISGLVLCGLPLAL	746
SYNCEPHALASTRUM	LEPTSRPDL--VVTYLSFRD--LSE-----TRVRLQY-KDELLISGLVLCGLPLAL	724
FUNCTIVORUM	--VTERGKIRKCVLFR--IKE-----VIGRIDQ--KDELLISGLVLCGLPLAL	750
HALBUM	SIPADELENKRNCFKLPK--LKE-----VEAASQY-KDELLISGLVLCGLPLAL	836
DUPURPUREUM	SNNNNPEEDKKNCFILPKK--IKE-----VSNFISH--KDELLISGLVLCGLPLAL	822
PVIOLACEUM	TTTCEEDENKKNCFILPGK--IKE-----VVNVVSH--KDELLISGLVLCGLPLAL	797
AMPHIPOD	---V--V--AS--RNLGELVVS--ASD-----CCETSQOY-SDELLISGLVLCGLPLAL	747
SHRIMP	---PEV--ETS--IHLHLSM--VRE-----LLQRCROY-RDELLISGLVLCGLPLAL	730
MUDCRAB	---PEV--ETL--IHLHLSM--VKD-----VLQRCROY-RDELLISGLVLCGLPLAL	728
TARDIGRADE	---IPTAAEPSANHVITISF--MRN-----LLGRLOH--SDELLISGLVLCGLPLAL	765
HYDRA	---DEK--ARLFRMLSA--VKE-----VSARVQOY-KDELLISGLVLCGLPLAL	694
SALPINGOBECA	--AGNMLV--AATLELMSK--GKE-----VMVRSQOY-KDELLISGLVLCGLPLAL	741
SPIDER	---DPGNLV--PQSYTLFSK--VKE-----TAVOHTQY-RDELLISGLVLCGLPLAL	747
LIMULUS	---PFQNER--LISFQLFSK--AKD-----AVISLQOY-KDELLISGLVLCGLPLAL	738
SCORPION	---SEKDC--LIAPFLFAK--SRE-----VVYTLQOY-KDELLISGLVLCGLPLAL	739
ROTIFFER	SSTISEYER--VMCFILFKK--LLE-----VSTRMKOY-KDELLISGLVLCGLPLAL	759
CLIONA	---WSDHQ--NNVKCIVOK--ATO-----VAARCKOY-KDELLISGLVLCGLPLAL	750
OCTOPOUS	---SSQTAEK--IACCLIKK--SKE-----LVQLKOY-KDELLISGLVLCGLPLAL	731
CAPITELLA	---RTSTAQE--EACFMLFTK--AKE-----VMTRLROY-KDELLISGLVLCGLPLAL	743
LIMPET	---EQEKQK--AVCYLLIKK--SKE-----VLVRMKOY-KDELLISGLVLCGLPLAL	726
SCALLOP	---IAGTQQR--DSSYLLMKK--SKE-----VLVRMKOY-KDELLISGLVLCGLPLAL	757
LINGULA	---IGTDR--ETAPFLFSK--TKE-----VLVRMKOY-KDELLISGLVLCGLPLAL	745
OYSTER	---KADIHQK--ATCFQLIQK--TKE-----VLVRMKOY-KDELLISGLVLCGLPLAL	742
SNAIL	---IDGQTEK--HLYTILIKK--SEE-----VLVRMKOY-KDELLISGLVLCGLPLAL	738
SPONGE	METEERTDR--QSCYFLFSS--IKE-----VVVMQOY-KDELLISGLVLCGLPLAL	751
PRIAPULA	PDADVDAE1--LNCFTLFSK--SKE-----VLVVKLMY-RDELLISGLVLCGLPLAL	759
DANTO	---GGTME--NACPSLLAK--GKE-----VCVRMKOY-KDELLISGLVLCGLPLAL	754
ESHARK	---HTDPEK--YACFALFKK--GKE-----VTRMKOY-KDELLISGLVLCGLPLAL	747
BSHARK	---PKNPEK--YACFALFKK--GKE-----VTRMKOY-KDELLISGLVLCGLPLAL	750
XENOPUS	---PEDPER--LSCFALFKK--GKE-----VSSKIROY-KDELLISGLVLCGLPLAL	761
STERLET	---PEDPEK--YACFALFKK--GKE-----VSSKIROY-KDELLISGLVLCGLPLAL	758
GAR	---PQDPEK--YACFALFKK--GKE-----VSVRMKOY-KDELLISGLVLCGLPLAL	747
HUMAN	---PEDPEK--YSCFALFKK--GKE-----VAVKMKOY-KDELLISGLVLCGLPLAL	740
PLATYPUS	---PEDPEK--YSCFALFKK--GKE-----VAVKMKOY-KDELLISGLVLCGLPLAL	742
TASDEVIL	---PEDPEK--YSCFALFKK--GKE-----VAVKMKOY-KDELLISGLVLCGLPLAL	745
COELACANTH	---SLDPEK--YACFALFKK--GKE-----VCARMKOY-KDELLISGLVLCGLPLAL	748
CAECILIAN	---PKDPER--YACFALFKK--GKE-----VSAKMKOY-KDELLISGLVLCGLPLAL	749
CANARY	---PEDPEK--SSCFALFKK--GKE-----VAAKMKOY-KDELLISGLVLCGLPLAL	739
OSTRICH	---PEDPEK--SSCFALFKK--GKE-----VAAKMKOY-KDELLISGLVLCGLPLAL	710
GECKO	---PEMPEK--SSCFALFKK--GKE-----VTRMKOY-KDELLISGLVLCGLPLAL	748
TURTLE	---PDDPEK--SSCFALFKK--GKE-----VTRMKOY-KDELLISGLVLCGLPLAL	748
ALLIGATOR	---PEDPEK--SSCFALFKK--GKE-----VTRMKOY-KDELLISGLVLCGLPLAL	708
APLYSIA	VATGAGQEV--EVTFLHKK--SKE-----VLVRMKOY-RNELLISGLVLCGLPLAL	745
TRICHOPLAX	---EAESIDK--YLCYLLYK--YKE-----VLVRLKOY-KDELLISGLVLCGLPLAL	729
SOFTCORAL	---QLDSDC--RNCFILFHK--AME-----VVVRMKOY-KDELLISGLVLCGLPLAL	746
STONYCORAL	LEIVDSDC--MKCFVLFHK--TKE-----VVVRMKOY-KDELLISGLVLCGLPLAL	757
SEA ANEMONE	---IVDSDC--TNCFILFHK--IKE-----VLKMKOY-KDELLISGLVLCGLPLAL	738
SEACUCU	EPWESGDR--QACFTLFAK--AKE-----VTVRLTOY-KDELLISGLVLCGLPLAL	754
LANCELET	---RDRPSEG--QACFTLFAK--VKE-----VLVRLKOY-KDELLISGLVLCGLPLAL	759
STARFISH	SSCVSASDR--CICFTLFAK--SKE-----VLVRLKOY-KDELLISGLVLCGLPLAL	759
SEA URCHIN	PSNVSLSDK--QACFTLFAK--SKE-----VLVRLKOY-KDELLISGLVLCGLPLAL	766

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	I>VKDNVLL-L-KSEYIQI I I N F --OMNSN--S I F N S I D L L I Q L I Q S E Y N Q K N Q K N L --	751
TETRAHYMENA	L L I D N Y S --F P R K N L I V A L K K F E L V Q N V --S M C F A M L E C L Q K I K R S -----K N--	774
STYLONCYTHIA	L Y R Q D K R T -D N V Q N W K V I M K R N I D L G R N N N --O L W N S I N M L E Q W F N L L -----P M--	771
APHANOMYCESa	V --D L ----A --I L V P A L K O M L A L G V F H F -D T W A M V E A L E R W R S -----D --	738
APHANOMYCESa	V --D V ----K --M L I P A L K O M L S L G T S H N -D T W A M V S A L E N W H O V Q -----P N--	727
PYTHIUM	V --P L ----V --D I V Q A M V P L L I G K S F L -P A D M V M T C L E R W Q O Q R -----P W--	769
PLASMOPOARA	V --A I ----H --A M V G I V K S M L D L G R S F I -P A M V M T A A L E R W Q O R -----P N--	770
BREMLIA	V --T I ----R --S M V G V K P L E L G R S F L -P A M V M T T L E R W Q I Q R -----P N--	767
AEDDES	L D S F L ----D S R K D L I E I L C S F O L K G M L -S L O N A M S C V R R L V A E G -----S P I--	760
MIDGE	L I E F A ----D --E F I P I F V I C P N V R S L L -S I M O M T C F D K M L D S L -----S D --	756
BOMBUS	V E N I L ----N --S T I P T F K L P T V G L S D F -E L C R M T L E K W T N H F -----D N E--	726
ANT	V K N L ----P --R T L P F K M P T L S S N L -D L C M T T L E T W T T T T T T H K R N E -----	751
WHIPWORM	A L E K R ----D --L I K K I R N P A L H L T Y L -P I S V G L D A L E K W S E O L -----C D --	763
TRICHIANELLA	V V E K L ----E --S I K E A I K S L K L L N Y L -P I C V M D A L E K W S A E F -----P E D--	761
BEEBLE	I K D M L ----S --T C T P S F R T F H V G R T S T -K L A Y L L E L T L E C W Q N E I -----D P D--	737
BARNACLE	A A D C A ----A --P L L A V A R L L R L G R S H L -P L A R M L D A L E S W L P A L -----A G C--	759
THRIP	A L P L L ----R --V C V P A F O S F O I C S M L -S L A H E L H T L S R W N Q D L -----P G E--	723
FLEA	I P E L L ----V --E A S I S L Q I I F K L G Y N H L -T L A S L A E T L E R W T D H L -----S K E--	708
WHITEFLY	I D P I L ----P --L I S S P L K V F R V G S S Y L -P L A D L M T T L E R W I D A F -----P P E--	746
TICK	V O E H A ----R --A L V P A V R M L O G L S Y L -P L A K S L D A L R L W E Q O L -----P A D--	743
TERMITE	V V P L L ----P --H A V P A F E V I F R V O R S M L -P L A R T G L S A L D K W C Y T L -----P S H--	755
DAPHNIA	V I S L S ----S --S I T G A L A S N K L G L T Y P -P L A E W H D A L E H W Q T T L -----P F --	707
OSTREOCOCCLUS	I --P M ----A --D L I S P L L R E L L Q Y P G M P I G V M D T L E R W I D G K -----H V --	778
STENTOR	V Y S D N I M M L S --L F E P I L Q M T L E L S H L -P L A S H S V L A N W R A S I -----P I --	704
KLEBSORIDIUM	I --E I ----R --Q L V G P O S T I M G L S Y Q -P L D A L D L E G W L K N H -----F R --	845
CLUBMOSS	I --D L ----A --S I V R P L K L K I L R Y H -P L A N H L D S L Q R W Y N L H -----P K --	752
MOSS	V --G I ----A --S I I P S L R N L K I L R Y P -P L A E V M D S L E R W Q A A F -----P E --	794
LIVERWORT	I --D I ----G --S L V P A M O N F K I L R Y P -P L A S V M D A L E R W H R L Y -----P R --	811
LIGNANO	L A V D R ----P D --D A L A A V R R G L R G R F W P -P L A E A M A A L E R W T A A A -----S S --	813
COPEPOD	V P G L F ----S --L L P D A W N I F K L S S I P -E L A N S M L K S I H G Y L E T F -----P E --	746
GLOBOSUM	T --T I ----E --S L C L P I E S L K M L S F T -P L A S V M D A I A V W S K L -----D R --	723
PALUSTRIS	I --S V ----Q --D T V O P L O I M L R L G L S F P -P L A N I M L T L E R W I A D F -----S A --	755
NEOCALLIMASTIX	I --S L ----N --D F I E P L K I I L L K L G E Y -S L A K L G L D A F E K C I S Y -----I P K--	830
GLOMUS	I --N I ----Q --N L I S P C I T M K M L S Y Q -P L A T T G A I N A E K L V D L Q -----G P Q--	811
LOBOSPOR	I --E P ----S --N I I P P K T A L K L G L G Y P -P L A S T A M E A I E R W V D -----I I D--	785
SYNCEPHALASTRUM	I --D I ----Q --Q V V O P L O T F E L L T Y H -P L A T S M D A L D Q T I A P D -----A P T--	765
FUNGIIVORUM	V --P I ----S --Q L I P A M A R F R E L A M Y -P L A K E D T W M K W I S D -----Y E --	790
HALBUM	V --N I ----P --V L I P T L S T F R L L S Y L -K L S H V E L N T I E Y L S V L -----P E --	876
DUPURPUREUM	I --S I ----P --L L V P I A N L P O Y K S Y L -P L A H I L N A I E Y W I T V V -----P K --	862
PVIOLACEUM	I --N V ----S --Q L V P I V C L A P O Y K S Y L -K L S H V E L N A I E Y W L K V V -----P Q --	837
AMPHIPOD	A R Q I L ----P --Q L S Q P M H T L A M G L S F L -P V L S N V A C L Q R L V D D L -----A F S Q	791
SHRIMP	V O E I F ----P --Q L V S P L O M M L G V S Y L -P L A E V G I L A L Q L W T X S L -----S Q E--	773
MUDCRAB	V I E I F ----P --R L I V P L O M M L H L G V S Y L -P L A E V G I A A L C K W T H L -----P S D--	771
TARDIGRADE	V I D N L ----S --A A M D A I V I D L O A K S Y L -P L A E A N V T L R R W C F D S -----D I --	807
HYDRA	I K E S K ----K --F I I P I F O V M L O L G L S Y Y -E I E L C L D T L D R L Q K K L -----N E --	736
SALPINGOEA	V K R D F ----A --V F F P A V E T M L S L G F Y -P L A D A G L S A L E T W L P P A -----L A --	783
SPIDER	V A K E I ----H --S L I P A L E S N K L G L S Y L -P L A E R V M A L E K W S T N L -----E L --	789
LIMULUS	V L S E I ----S --H L V P S L E C H F O L G L S Y L -P L A T A L E A L E V W S T K L -----P P --	780
SCORPION	V E S E I ----N --L I P A V O M L G L S Y L -P L A M S D A L E T W L Y S L -----P S --	781
ROTIFFER	V I S I M ----D --H S F I C L N O L L R W N Y L -K L E P A M S L E Y W L K N I -----P T --	801
CIONA	C K D I L ----P --Q L I P A V O R C O L L S Y S -P L A E A M S A L L R W R S I P -----I S --	792
OCTOPUS	I V D Q I ----D --D L L P A I O M S L I S T Y L -P L A N A M D T L E Y W S E T L -----S Q --	773
CAPITELLA	I A L D V ----T --T F V P A L O R S L E I G R S Y L -P L A R T S I N T L E S W S K S L -----P P --	785
LIMPET	I T E O M ----I --D V V P A I O V M T L G L S Y L -P L A G I N D A L E Y W C H N L -----P D --	768
SCALLOP	V A Q O M ----V --E V V P V I Q I L K M L S Y L -P L A K V M L D A L E Y W S D T L -----P A --	799
LINGULA	V I A D L ----P --T I V P A L K I G F K L G L S Y Q -P L A E V G M E A L E F W R D S I -----P N --	787
OYSTER	V S E Q M ----S --S V V P A I O L L S T I G L Y L -P L A M I M L D A L D Y W S D T L -----P A --	784
SNAIL	I A Q O M ----S --K I V P A I O L F S V G L S Y L -P L A E V G L D S L V W W S Q V L -----P P --	780
SPONGE	V V S D F ----K --E L I P A I K I A L R I G M G Y L -P L A K S M E A L E K W T L Y I -----V E S D	795
PRIAPULA	V V D I V ----P --E I V P A V O V M K I G L S Y P -P M O H T L D A L E M W V A N L -----P A --	801
DANTO	V A L D I ----K --A Y P A L O M F R L G L S H A -P L A T A M D A L E S W S S F I -----P A --	796
ESHARK	I E L D I ----K --A Y P A L O M F K L G L S H T -P L A D A L D A L E D W S A H I -----P K --	789
BSHARK	I E L D I ----K --T P I P A L O T F K L L S H I -P L A D A L D A L E H W S T R I -----S K --	792
XENOPUS	I M M D I ----K --A Y P A L O T F K L L S C P -P L A D V G L N A L Q Y W S T N I -----P S --	803
STERLET	V A L D I ----K --A Y P A L O M F K L G L S H T -P L A N T L Y A L E N W S Q F I -----P K --	800
GAR	V A L D I ----K --A Y V P A L O T M K L G L S H T -P L A S A M L D A L E E W S S R I -----S Q --	789
HUMAN	I E L D V ----R --A Y V P A L O M F K L G L S Y T -P L A E V G L N A L E E W S Y I -----D R --	782
PLATYPUS	I M L D I ----K --A Y P A L O M F K L G L S Y P -P L A D V G L N A L E E W S Y I -----P R --	784
TASDEVIL	I E L D I ----K --A Y V P A L O M F K L G L S Y T -P L A E V G L N A L E E W S L Y I -----P K --	787
COELACANTH	V E L D V ----K --A Y P A L O M F K L G L S Y T -P L A D S G L D A L E E W S N R I -----P K --	790
CAECILIAN	I M L D I ----K --A Y P A L O T M F K L G L S Y S -P L A D A G L D A L E D W S A Y I -----P Q --	791
CANARY	I M L D I ----K --A Y P A L O M F K L G L S C T -P M O D L G D A L E D W S A H I -----P R --	781
OSTRICH	I M L D I ----K --A Y P A L O M F K L G L S C I -P M O D L G D A L E D W S A H I -----P K --	752
GECKO	I M L D I ----K --A Y P A L O M F K L G L S Y T -P M O D L D A L E D W S A H I -----P R --	790
TURTLE	I M L D I ----K --A Y P A L O M F K L G L S Y T -P M O D L G D A L E D W S A Y I -----P K --	790
ALLIGATOR	I M L D I ----K --A Y V P A L O M F K L G L S Y T -P M O D V M L A L E D W S S H I -----P K --	750
APLYSIA	I V D O M ----S --S V V P A I O V M T L G L S Y L -P L A E V G L A L E S W F R O L -----P A --	787
TRICHOPLAX	I O D D M ----A --L I I P A I K V S M N I G L S Y L -P L A N A M D A L E R W S S D L -----P Q --	771
SOFTCORAL	V L C D I ----D --I I I P T L K T F K L G L G F L -P L A E A M D A L D T W T A E L -----P S --	788
STONYCORAL	V T L D L ----V --S S V A A K L I F K L G L S Y T -P L A E A G L D A L E S W T T A L -----P A --	799
SEA ANEMONE	V A V D V ----A --A I V P A L E L F K L G L S Y L -P L A Q A G L A A L E E W N A S L -----P G --	780
SEACUCU	V Q Q E V ----N --N L V P A L O M F K L G L S Y L -P L A E A C T S S L Q M W T N N L -----P I --	796
LANCELET	V O S E I ----S --T L V P A L O T F R L G L S Y L -P L A H A G L D A L E R W L N L N -----P R --	801
STARFISH	V O A E V ----A --H L V P A L O M F O L G L S Y L -P L A E T G L E A L E R W M L H L -----L P --	801
SEA_URCHIN	V E N Q V ----H --D V I P A L K T F K L G L S Y L -P L A E S L S A L Q A W I R Y I -----P S --	808

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	----KYLL----KILKNVLPKLSYMQLVPEQEKPFYTP-----	782
TETRAHYMENA	----RVVF----KYLKLVIPYLSLITKGELEERIT---S-----D-----	805
STYLNCHIA	----NVTL----DLYHDILPKLSDFLQVDDNKKOKKLNDAATG-----G-----	806
APHANOMYCEsA	----TVV----PFYEVLPPLAPVLDEAA-----	759
APHANOMYCEsE	----ALK----QFYQELLPLFAPVLISTS-----	747
PYTHIUM	----ELD----LVLDQIVPCLTAYFDQSDAVDPEIVVIKGD-----	802
PLASMOPARA	----ELN----DVICDITPLISAALNQEKLGEREHLKDAT-----	803
BREMIA	----ELE----DSISDILPLLELVDQEGLSKDELWLMKP-----	799
AEDDES	----SSE----NRDRVLVHVLPLLDVLIQTRDVALPPPISRL-----VKF-----Q	799
MIDGE	----DPK----TREKLLQEVLPCLLESFLSTRDSSGSDKDFQKSL-----KN-----	793
BOMBUS	----LTA----MFLQEVLPFLPEPLHSGESSVEFLQDIK-----	758
ANT	----QTN----ELVRELVVLEPFLRSTESSVEISQDLT-----	783
WHIPWORM	----DSE----RQQFYNELAPVLDEYLRCTKFBGRKVVDPPE-----MAGIYKA-----A	805
TRICHIANELLA	----EPO----LDSFYTDLLPIFDDYLRCTKSVDETLLVNNGPNYNGEKSTFFN-----K	807
BEEBLE	----EFE----PFLKQILPLFDSYLSQSKLSMESSSGINDN-----R-----	770
BARNACLE	----SERWGDCEPLRAMAPALSQLAPEATVAAGG-----	791
THRIP	----KMR----ILLKAVLPSFDSLLQTKDSVPVDEDDGNL-----YGM-----T	759
FLEA	----QNT----ILLDEVLSCLEPVLQSQGLIGDPVKVCL-----ITD-----S	744
WHITEFLY	----KIN----PFLKEILPCLDSFLRSKDFEGDPEAANGL-----DAE-----F	782
TICK	----VAD----DVFRQVLPGLCPVLALG-VRAGITEPAES-----TKR-----A	778
TERMITE	----LVT----PLLMQVLPYLDPLRSQGVASGDVIEK-----E-----L	789
DAPHNIA	----STFD----SIMEEVLPCLEGLSDVEELAKEVFTFI-----SG-----	740
OSTREOCOCCLUS	----KRVs----QYLPQILKRLCALDSAAKSDSLFSSNEPE-D-E-----KRSIV	819
STERNTOR	----KAFB----ELLPKILPALSFLILAKITQEVQGVED-----	737
KLEBSORMIDIUM	----ELE----PHLPEVPLNDYLAEDVDSGAGMSGAG-D-EVA---EKR-----	885
CLUBMOSS	----ELQ----KQLQDINPCLRDYLFVADSRKKTMDSK-----	783
MOSS	----QLQ----HWLPOIIPCLNDYLVDEKADVSEPGTSLV-T-EAVGTSAP-----	836
LIVERWORT	----ELE----IWLPTIVRCLSDYMAEVEITELSDSSSDLT-T-TLE---SSS-----	851
LIGNANO	----AGL----SDRVAPVLAGLLAVLLSDGGSGAGLTDAAE-EAQRGGADRRS-L	858
COPEPOD	----SELE----LILEKVLPLNLRVYLSYQHQTSENAELKM-----	778
GLOBOSUM	----KTLA----SSYAKILPSLNDYLLDLEETASTVSGKA-T-SK-----	760
PALUSTRIS	----NDLR----PAYKVLPLLADYLVLDVESDQSSSAPRQ-S-LGKKG-----PA	797
NEOCALLIMASTIX	----DKLK----KYYKDFPLFNRYFINGEERKDAE-LDDYI-S-TNK-----	867
GLOMUS	----D-IS----KWLEQILPLFNEYLLVADSDVNS-IKEFA-Q-IRNTQRNRGRNF	856
LOBOSPOR	----HGQE----IWLSQLPVLSDYLMVELTVNGDNLPEAT-S-LKSKQ-----	825
SYNCEPHALASTRUM	----SAML----CPLGSLPVLNEYLMRQELIEEADDSVKRR-K-TFN-V-----	804
FUNCTIVORUM	----QMK----VHLSALPLMEALYLLINVDTSSQDN-----	821
HALBUM	----EVD----AHLVAILPLSDYFLISTNTSSSSNOESAN-S-KTGM-----	915
DUPURPUREUM	----EVH----SHLDKILPSLNDYLIKISTNGLDSSVNSN-T-Q-DLHLMK-----	903
PVIOLACEUM	----QVH----NNLHLILPHLNDYLLMSSAAVNSSSGEGSS-T-SISIAFSE---EK	881
AMPHIPOD	DEKYKANIR----GLVQSVPLDILLVQSPOR-ERSELQS---R-VINVKL-----	833
SHRIMP	----ILS----EHPHVLPLLLPLRSQETGGEAEVHT---R-VITVKM-----	810
MUDCRAB	----ILH----QHLPAVLPLLLPLRSKET-GEVEVQT---R-VITVKM-----	807
TARDIGRADE	D--RQLLQ----PYFSAILPVLGDYLRSTLTDVTERSKV-----VLGT-----	844
HYDRA	----SDME----SIVRVLPHFNDYIQPIFKEEDSYTEHV-----TLT-----	771
SALPINGOECA	----AG----RPPAQLMPLLDKYLAAVAASDIDVEE-----EMKLSR-----	730
SPIDER	----NILK----PYFPRILPLANSYLLVTAAGSVLSNEKR-----PS-----	825
LIMULUS	----EVLK----PYTPQILPHLNGYLVGKSTNLDDESAGVPL-----LSRTSS-----	820
SCORPION	----ELLK----EHYKILPSLNDYFLASDNI SLQPLKNIHT-----FTKQSL-----	821
ROTIFFER	----QLLK----PYFSLIKFEMFLQASNKSDLDSE---K-VILLML-----	840
CLIONA	----NR----KCYLDINCLQYFNLSEETNTSTQNTLK---LKP-----	826
OCTOPUS	----DALK----TVYSQVPLPHLDFIKTSERDSDIDLTL-----	804
CAPITELLA	----DVMK----PFYEQLLPYLDAYLTSADAK-NDTLS---L-VQKDP-----	821
LIMPET	----HIVK----PHYSCLPPLDNYLRTVDK-GMVAFSIF-M-WYISCGM-----	807
SCALLOP	----SVIQ----PHYSQILPYLDTYKRTADK-GAEVSVSD-G-TVNMTKS-----	838
LINGULA	----HLLQ----PHYQDILPCLDDYLRKQSEQAGNETNSPS-T-LIMEPKG-----	828
OYSTER	----SVIR----PFYPQILPCLDSYLRKMDQ-GADDVSEN-T-MEM-NKS-----	822
SNAIL	----EVLK----PHYANILPCLDSYLRKTVDT-GAEDVSVE-T-LVTVSSS-----	819
SPONGE	K--MDTLQ----CLVNEILPLLADYLRKATSVOLKEEDGGR-----GRQ-----	833
PRIAPULA	----DVMQ----PYKQILPHLDGILKRTTEGADSVPT-----P-TVAITSA-----	838
DANTO	----AILQ----PHYTDILPHLDGILKRTSSSEKDDSN---W-EVTFVST-----	834
ESHARK	----HTIQ----PHYKILPHLDGILKRTAANF-NEAQNN---W-EVMQINN-----	826
BHARK	----HVIE----PYKQILPHLDGILKRTAAS-NEPESN---W-EMMSMT-----	829
XENOPUS	----DILK----PYKQILPHLDGILKRTSSTNESLST---L-DMVRI SR-----	841
STERLET	----YVMQ----PHYKQILPHLDGILKRTASNDDEEQNN---W-EVMSLSR-----	838
GAR	----PLIQ----PLYRDVLPCLDGYLRTAASNGSDQNT---W-EVMCLSS-----	827
HUMAN	----HVMQ----PYKQILPHLDGILKRTSALSDETENN---W-EVSALSR-----	820
PLATYPUS	----HVIQ----PYKQILPHLDGILKRTALSDETENN---W-EVMSLSR-----	822
TASDEVIL	----HTIQ----PYKQILPHLDGILKRTALSDDNKN---E-EVTVLSR-----	825
COELACANTH	----WVLQ----PYKQILPHLDGILKRTSISAGDTSS---W-EVRLSR-----	828
CAECILIAN	----YVIQ----PHYSELPLPYLDGILKRTASSADEYQNS---W-EVMRLSR-----	829
CANARY	----HMMQ----PYKQVLPPLDGYLKSSTSTVESQNN---W-EVRKLSQ-----	819
OSTRICH	----HIMQ----PYKQVLPPLDGYLKSSTSTVESQNN---W-EVRKLSR-----	790
GECKO	----YTMQ----PYKQILPHLDGILKRTSSTVESQNN---W-EVKLSQ-----	828
TURTLE	----HIMQ----PYKQILPHLDGILKRTSSTVESQNN---W-EVRKLSR-----	828
ALLIGATOR	----NIMQ----PYKQVLPPLDGYLKRTASPFEPQNN---W-EVKLSQ-----	788
APLYSIA	----SVLE----AHYTSILPYLDYLRDLDLGAEDVVK---E-TTVVSA-----	825
TRICHOPLAX	----NLIQ----PYFSDILPCFDDYLRKSSADDTTETLVEDSS---KALK-----	809
SOFTCORAL	----ELLH----PYLREVLPLDGYLKTASELETSEKETKL-R-S-----	824
STONYCORAL	----DKLK----PFLREILPCLDGYLRTLGDQLHNE---CN-T-IVLITSS-----	838
SEA ANEMONE	----DVLK----RHLRNILPYLDGYLKSATDAVEEQDQVSR-R-TATLRST-----	822
SEACUCU	----DTLT----KPLKRVLPPLDGYLRARSSEDAAPN---QF-V-EM-KGTL-----	834
LANCELET	----SALE----PHFPILPYLDSYLRQTAADTSSSSSD-GF-Q-TVSLTAA-----	842
STARFISH	----DSLQ----PHLKVILPLDGYLRGTITQGSADAVVQT-V-TMASASS-----	843
SEA_URCHIN	----DVLK----PYAQLPQLDGYLGAGSGSEDEGS---RP-E-VLVIQTA-----	847

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----IQYIDS-----ISPNIL-----LSESHIDQNHIVDKVRYFLSIIGGLCH	821
TETRAHYMENA	-----MKYKQSNQQRDIPNLT-----VSELGQRKDLIRVTWNLLADIGGESH	850
STYLONCHEIA	-----DTYQYL-----EMLKS-----GNEVNIERKDIALKVMDDLKIGGNAH	844
APHANOMYCEsA	-----NQSAFQIIVLRLLSLGGYSR	781
APHANOMYCEsE	-----NEGLTVQLKLLKILSMGGYSR	769
PYTHIUM	-----ASDGGNS-----ESANATERSKLRORIMVLKMGGYGA	836
PLASMOPARA	-----LQGVKAT-----GSDEASDLAQQVORRLLLLRCDGNIL	837
BREMIA	-----RGTDTV-----NTDEISNFTQORRLLLLNCGGNIS	832
AEDES	RKRSVHL--TS--SKIEKIKQLA-----LEASESDLVKLQLRILVFLADLDPNVC	846
MIDGE	-----S-----FII-----QTTIETDLTRFKKRLLLTRFPDNDV	824
BOMBUS	-----TERKVIKRII-----LRDDENTLERFQMRVLLFISLDTNII	795
ANT	-----TNK-RVKRID-----VIDTCTIQNRORVLLFLSLDMDLL	819
WHIPWORM	QLKGVRR--S--KQVQVQLQTKI-----DASGETAQRVLRRAVFSVSHGHVDS	851
TRICHINELLA	KLQTVNS--DS--ENVLVKADDND-----SEEMPNSQVSLRIRASVFSVSLGCYMN	854
BEEBLE	-----R--KSSQALKKRV-----LLDTEPELLRLTKMKIFVQVNSLLC	809
BARNACLE	-----DRAP-----SSRRPSELTPLRRRALQLLLAAAG-	821
THRIP	MVKTV--LQE--QKKKLLWYKV-----NSHSDTEVLKQKVVVFLTLDSVVC	805
FLEA	-----RSQKVKKQI-----IEGTPSELALQORLITFIKLSSMDC	781
WHITEFLY	KVLTSL-----RKSRRKIKKI-----HERQDTELFRIQRILMLKIDISTA	826
TICK	RSQGRHK-VSL-KL-LYQKRDQ-----IKVP--ETESRLRDLVLCFLGLQGHRR	823
TERMITE	MVLGRNRTNY--SQNKVARKKI-----IEHPESELSQHQHETISFLQDSTTC	838
DAPHNIA	-----KRFKRRKPN-----IQSTEERESWEKIRRRVRLIRMGPKCS	778
OSTREOCOCCUS	IWGGKRRKQL-----AG-KTEE-----QEDVVLKRAFLRITKTHIIMGGGACH	862
STENTOR	-----QLARQKKNLAIYRIVKFLSLGGACH	763
KLBSORMIDIUM	-----NTADMTRTQA-----RRQREARAK-----DMQAFPELQORFLRIGCHSH	930
CLUBMOSS	-----TLKLEKE-----KTKVVTPELQVVRQVFLQIYGAYH	817
MOSS	-TISMSRSGQL--AQIKRARAK-----DSQSPPELQVVRQVFLCIGGLGH	881
LIVERWORT	-SRESLSRLQL--ARLKKTRAQ-----ASQAGPELTOIRIQKFLQIGGFNH	896
LIGNANO	ARQSVARALRSIEARRARAKNYA--AGGAELGLAEMQKRVLLFLSAQSSFK	909
COPEPOD	---RRRAPVVKTRRNKLESEGIA--K--NYEEENC--QLALGILKVVSSKLR	823
GLOBOSUM	---ART--K--HLKTHKHNEQM-----DEQIVQDLKSQIRILKLLSLGQDSR	803
PALUSTRIS	SS-QRASA--A--NTRAKAALATI-----DETTNQLRATRYRIVLQIMIGDNR	844
NEOCALLIMASTIX	-----M--KTMKKINKYEKE-----IVEETNNNKIKVRLILMIGDGIP	905
GLOMUS	KSLDQTKERV--KSGQKKSQYTVVG-----IGQLERNVGLHDLQVVRVRLIRLGGVSK	910
LOBOSPOR	-----K--GSARQSQSYKVVARSASIPNLPQVQESMRDLQLRILRLLRRAQYNK	873
SYNCEPHALASTRUM	-----A--AAKNFQWRWTLN-----ESQTSQVSVLRLQLRFLRSLAGASK	847
FUNCTIVORUM	-----MGRGAAPR-----MNTKSIDFVD-----PKLQAQRTVVEEQTIRVIRLKLGGQNY	962
HALBUM	---ETWSRHRK---MKYKSYSNID-----PKLQPKTSTIEDLQNRILRILKLGDNII	950
PVIOLACEUM	LSVGGFNKXK---KF-KSNSID-----PKLQPKTSTVEDIQNRILRILKLGDNIS	928
AMPHIPOD	SLLNQRRRVDV---RMR---D---AR-CSKVSPSIDLERVVLKLLSLGPDVC	877
SHRIMP	AFARQRRKVDQ---KMK---E---SK-RVEETAMQKIQMLTLRILSLDPLLR	854
MUDCRAB	AYANQRRKVDQ---KKIL---A---SK-QVDATAMKRVQSLILQLIGLDPPLG	851
TARDIGRADE	GKGRKRRSPV-----AV-GTDQVALTRVRETLSPDLGGKYN	883
HYDRA	KSERKVVVPI---RYLKAL-AMS---QK-DLSESPFLNLELRVIFKFLCGLGRLS	819
SALPINGOECA	SITRKRREAAV-----VA-VSDSNPFAALKMRILRILMAMGGQHN	858
SPIDER	-KKAYKMSVKS---MKRSNKNSTSS---DN-SLEDPALGRILQLILKYLQJGE-NN	872
LIMULUS	-KNKFAKSPA---NFKKVNKDN---QS-KVQETETVLRILRILKFLSLGGKNN	868
SCORPION	-V---VRKXLP---LKSQPKKIK---QT-DLHESELIVQHRILRFLSLGQIN	866
ROTIFFER	HKGRKRLPV---KLFDKSSL-----NFDVYEQKQKILKILQLSADMS	883
CIONA	KSRSPAQK---LMS---LK-ELDEPARKKARNQVIRFLSMGCSDD	865
OCTOPUS	NIDQKRR-----YF---L---DPDSELKIKYRIAKYLINIGGFN	840
CAPITELLA	MKQGGKKIPV---KLLKQTM-FD---AE-KGKESELKEIQRCVLLSLGGSIN	869
LIMPET	H---IRFSLF---SSFSSFTINCLL---YF-QSYESKLGVIDRVOVLLSLGGSIN	856
SCALLOP	KTGRGRKLAV---RMVRGPKDQ---LK-KGYESELQVLRVMRYLGLGGSQN	887
LINGULA	HSYGRKGLPI---KLLKPAV-----A-KEESSQLELLKQVIFKFLNLGGATN	873
OYSTER	KSGKGRKLPV---RILKGP-KD---SK-QVFTQLAKRVQRMVTLRILGGEVN	870
SNAIL	KSKYGRKLPV---RLVKERPVD---LD-KGYESQLSVVQKIVTYLTLGGSMN	868
SPONGE	YATKRYAR--M---KMVE-KWSEG---LH-QGSRDDITSVRRRILLLSLGGVNV	879
PRILAPULA	NATRGKRRIPV---KLLQSGKRM-----AEDSALTARMRVIRFLGLGGMAN	884
DANTO	GSSKGYGVLL---RLLKSKRFS---L---GDESPIAAVRRVRLHLGGQLN	881
ESHARK	PSRKGSKVLP---HHFKSKFEL---V---SEDSATVARRVLLSLGQIN	873
BSHARK	-SSKGNKVLII---RRLKNARDLS---M---SEETPAAVKRVVRLSLGQIN	875
XENOPUS	SLHKGFNKQLI---QQLKRMKTLs---V---KEESSLTAVRRVRLSLGQIN	888
STERLET	STEKYGRVLM---RLLKAKRFS---L---TEDSPTALVRRVRLHLGGQIN	885
GAR	GAEKYGVRVL---RLLKRTKHLs---M---AEDSPSAVRRVRLHLGGQLN	874
HUMAN	AAQGFNKNVVI---KHLKTKNLS---S---NEAISLEEIRIVQMLSLGQIN	867
PLATYPUS	ATQGFNKNVVV---RHLKAKATA---P---VEDLSLESVRRVRLSLGQIN	869
TASDEVIL	AAQGFNKNVVI---KHLKSKTIL---S---DAEMSLEAVRQVIRVLSLGGQIN	872
COELACANTH	ASQKGDHVLII---RLLKAKAVS---L---NEDSSLGAVRGRVRLSLGGQIN	875
CAECILIAN	AAQGFNKNVVI---QRLKRTKTLs---L---DQDVSLASTRNRVQVLLSLGGQIN	876
CANARY	AAQGFNKNVVI---QRLKRTKTLs---V---DNPSLQAVRTRVARLLSLGGQIN	866
OSTRICH	AAQGFNKNVVI---QHLKRAKTLs---L---VGDPSLEAVRTRVARLLSLGGQIN	836
GECKO	AVQKGNKVVII---QRLKAKSLA---L---EDHSLEAVRTRVARLLSLGGQIN	875
TURTLE	AAQGFNKNVVI---QRLKAKTLs---L---EDHSLEAVRTRVARLLSLGGQIN	875
ALLIGATOR	AVQKGNKVVII---QRLKAKALS---L---NEDLSLEAVRTRVARLLSLGGQIN	835
APLYSIA	KKSSRRSKAPI---RLKNAQSD---DK---GSKSLSQVQKRLVFLSLGGQIN	873
TRICHOPLAX	ARTGKAKLPV---KVVNP-----TG-GSKDSPLAQVRLRIVQLRILGGNTN	853
SOFTCORAL	-RKSQTK-----ASKSKRN---PN-EEENSPLNVRHRIILLTLGGKCN	867
STONYCORAL	HHTSRGRKLP---KLLKMKP-QS---QH-QMTLTPAKVRHKLRFMFLGGGETN	886
SEA_ANEMONE	YSRLGKILSLY---YIDFVSKRNI---LP-QVGESLVTIRVILRLLQLGGHTN	871
SEAUCUE	GSGAGRRIPV---KLLKTSGGAG---KV-GATTSPLRDIQHLQLLGLGGKTN	883
LANCELET	SSTRGRRIPV---KLLKAAAERN---Q---VQESDLVKARLIRVFLSLGGHTN	889
STARFISH	SGRAGRRLPA---KLIKGASTTG---Q---TQDSPLRSVQLRILHLSLGGQTN	890
SEA_URCHIN	SSRVGRRRIPS---KLLKAKDND---Q---SQDSPLRSVQLRILHLSLGGSVN	894

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	LIVDETY-----NESLLALDY--NSP TT INIP-- V GQRK---MK	853
TETRAHYMENA	LIVLSEKGFQGNVERQLLSEFENLQISKGVSLISWDY--EAKVLPFLP-- L LAKK---ID	904
STYLNCHIA	SIIISNEQNKL-----IERENFIKWDP--EKRLKFTVP-- L YTKK---VD	881
APHANOMYCESa	FVVQEHAA-----RDDV---DKM--AAALTFPVA--LDRVH---AD	813
APHANOMYCESa	YVVQEEDPQ-----LQI--SAPLDISLA--MENVH---VE	797
PYTHIUM	LLASRGANT-----AD--AKRGFQ--TSTLQQLPI--LNDIT---ID	869
PLASMOPARA	LLVSEPPSL-----ITASGIVGGIF--SPHFRLELR--LSETP---LS	873
BREMIA	LLMSEPPSV-----INSNSMIKMS--SPYFRLELR--LGEVS---AS	868
AEDES	TKMILRSETDDA--A-----QQTADLEKPLVLDLSDNRNLSLQLSVIGIR---PI	893
MIDGE	KFILSKFDQKLV--R-----DH-----VANVFRIRLRC D PLI---PN	857
BOMBUS	MDFIYK--SM-----NTGATWOK--KDLLKYSLL--PSDTQ---AD	828
ANT	TSVHERA--SR-----STGASWH--KDLLKXKLP--LPAAR---LN	853
WHIPWORM	KALLQVNSRMVK-----QVLRWTT--DRLLNFPCC--FPDVK---ID	887
TRICHINELLA	RFLIDSA---DV-----GSLLRWGQ--GSHLEFICB--FDMK---FE	887
BEEBLE	EALAVSE--DN-----ADLTVMAN--EQHLKIDL--YEDVK---LQ	842
BARNACLE	--LVADS--SE-----AELVAWSR--RPLVGLDVP--FSDVK---PK	852
THRIP	LSLLDGSE--DR-----VGVTAWQK--ERLLKFPMP--FDMK---VD	839
FLA	SSLISKNISNHY-----DHLIPWDL--KQHLRFRLP--QGVK---PL	817
WHITEFLY	LTILSEDS-----TRSKWKS--TKQLKFTIP--FPDCR---LN	857
TICK	ALLLADLERDTL-----KAALAWDPETKEHLVFPALP--FPDTR---VE	861
TERMITE	LALLKDPQ--QE-----EDVIPWATCLOQLVFPPLP--FKDMK---LN	874
DAPHNIA	RLVAQNE-----DHVIARSATGWQI--KGHLEFGLP--LSDMK---PI	814
OSTREOCOCCUS	GLLEDMKP-----SKLDLPWDR--NCKLPTPI--LVRSS---TN	895
STENTOR	YLVA-----QWLEHLAWDS--QPLRMKIR--ENLKY---LE	795
KLEBSORMIDIUM	LLVPDNL-----TKDQOSALAWD--KDLKFLP--FDEK---PD	967
CLUBMOSS	FLVPDANL-----LQSSGTGGLSMDV--VDRIKFTVP--LREK---LD	854
MOSS	FLVPEVDL-----LQLTGTGGLAWDP--IDRVKFLP--FRQDK---PD	918
LIVERWORT	HLVPELNL-----LQLAGTGGLAWDS--VDRLOFTIP--FREK---YD	933
LIGNANO	YQLAEIAS-----DKAATADLAASP--GGRLLYFDLP--FADSK---PR	947
COPEPOD	YLSLPT-----KEEIGRAAVVWDQ--QKHLVEV--LRDVN---LP	858
GLOBOSUM	LMLSN-----ETSASLLAWDT--EMNLKQVQP--FKEAI---FD	835
PALUSTRIS	FLLEE-----GRGSQQLAWDT--EKRVFMDP--FKEIN---CR	877
NEOCALLIMASTIX	YLYSN-----FDIKDYKWDP--ENGITFILH--FVDFQ---TE	937
GLOMUS	FLFEDIVNNDLV--YRP IPTMNPAGSKMSNNKLLAWDP--EKRVSNIP--FPDTR---VE	962
LOBOSPOR	LILAQRTADEV D--K-----RNTSDLLAWDP--ETRLKRLP--FLEMK---AE	913
SYNCEPHALASTRUM	LMIQTPHLQNKD--ERT-----KALGTYDKMLAWDP--ARPLKVRMA--FQAT---ID	893
FUNGIVORUM	YMTSD-----HDMKGLAWD--FKVRFPLP--FPDVK---VD	877
HALBUM	HLMGSVNL-----MAPCTESGVAWDT--ISRLOQIIP--LGLDN---GVS	1000
DPURPUREUM	HFLGVEVL-----LAPGTESGVAWDT--EQXLIKIP--FTDQTASAI E	990
PVIOLACEUM	FFLGDVNL-----LASGTETGVAWDT--EQKLSFEFF--FIDQKA---N	965
AMPHIPOD	SALSSETGVSAN--T-----SSEPGIAVEDTGRWDE--CDHVALKIP--YEHST---LD	923
SHRIMP	LHTIPQ-----DPDTIASAAVRWNV--QKLVKFATP--FEHIK---ID	890
MUDCRAB	QYVIPQ-----DADSLAAAVCWDS--KQHIRFAMP--FGQAK---ID	887
TARDIGRADE	HLIVDGF-----LNDVKNLALAWDM--VQHLQFSVP--FDDMM---LKS	921
HYDRA	IGILO-----NAAKFSKHVWDT--NQHLFPALP--FRDMK---PT	853
SALPINGOEA	HELAALHQGAG--G-----GSDVGEGETPPVWADM--TNHLKFAVP--FOEMK---PE	904
SPIDER	VALLE--QS-----HQKVDEVAIAWDPLCKRNHLKYSVP--FVDMK---PN	910
LIMULUS	KALLE--KS-----EKEISEKAI SWDNRVQDHLKFAVP--FDMK---PE	906
SCORPION	FAMLS--AD-----KIKTHEVAVWIDNKQHLKFPILP--FIDVK---LE	904
ROTIFFER	HSVHL--ID-----NEDTISWDT--VQHLKFPV--FDIK---PT	915
CIONA	HGDLN-----EDAGLAVAPWDE--DVNIQYPIP--FRDLK---PC	898
OCTOPIUS	KDLLA--NS-----DQDVLKHAVAWDT--KKHLKFDLP--FDMK---PT	876
CAPITELLA	HALVF--GO-----TAN--PPDLVWDS--DQHLKFDLP--FLDIK---TS	904
LIMPET	YTLT--NS-----ODDISKQALAWDT--EQHLRFETP--FIDMK---PI	892
SCALLOP	HAMLA--DN-----EAEVSRQALAWDT--HRHLKFDMP--FIDMK---PT	923
LINGULA	AAMVQ--CT-----SEDIKAVAWDQ--EKHLKFDMP--FMDVK---AA	909
OYSTER	HALLS--G-----SDVCEEALAWDA--EQHLRFDPV--FMDMK---PQ	904
SNAIL	FALLA--RR-----EEEISRRALAWDT--EQHLRFDPV--FMDMK---PS	904
SPONGE	ESLSKVPS-----QHSLSVWDS--DRRLGFAVP--FSDLK---PE	912
PRIAPULA	ISLIS--CD-----AEDIAKAVAWDA--EKHLKGFVP--FDMK---PV	920
DANTIO	RSLVTAVS-----AEDMMKRFVAWDC--EKRLSFAVP--FDMK---PV	918
ESHARK	RSLVTAVS-----AEEMMKCIAWDT--EKRLSFAVP--FDMK---PI	910
BHARK	RSLVAATS-----SEEMMKCVAWVA--ERPLSFAVP--FDMK---PV	912
XENOPUS	RSLVTAAS-----TEEMIKRHVSWDT--EKRLRFDPV--FKDLK---PV	925
STERLET	RSLVTATS-----AEEMMKKFVWDS--EKRLFAVP--FDMK---PV	922
GAR	RSLVTAAS-----AEEMMKKFVWDS--EKRLFAVP--FDMK---PV	911
HUMAN	KNLLTVTS-----SDEMMSKYVADR--EKRLSFAVP--FREM--PV	904
PLATYPUS	RNIVTAAS-----ADEMMKKCVAWDT--EKRLSFAVP--FAEMK---PV	906
TASDEVIL	RNLVTAAS-----SDEIMKKCLAWDS--EKRLSFAVP--FAEMK---PV	909
COELACANTH	RSLVTAAS-----SEEMMKFVSWDT--EKRLSFAVP--FDMK---PV	912
CAECILIAN	QSLVTASC-----AEEMMKKYVSWDT--EKRLSFAVP--FVDMK---PI	913
CANARY	HNLITATS-----AEEMMKCVSWDT--EKHLKFAVP--FDMK---PV	903
OSTRICH	HNLITATS-----AEEMMKCVSWDT--EKRLSFAVP--FDMK---PV	873
GECKO	RNLVTAAS-----AEEMMKFVSWDT--EKHLKFAVP--FDMK---PV	912
TURTLE	RNLITAS-----TEEMMKFVSWDT--EKHLKFAVP--FDMK---PV	912
ALLIGATOR	RSLVTAAS-----EEMMKKFVSWDS--EKHLNFAVP--FVDMK---PV	872
APLYSIA	HTLQD--RA-----DADISNEAVWDS--QKHLRFDPV--FDMK---PV	909
TRICHOPLAX	SLVIR--KG-----NDDGSSQAVAWDN--HKRLPFAIP--FDMK---PI	889
SOFTCORAL	LGLLEG--G-----EGSVASSGLAWDT--KQHLKFAVP--FDMK---PT	903
STONYCORAL	ILLLDN-----TGINSNNAVWDT--ENHLTFAPV--FDMK---PS	921
SEA ANEMONE	LCLLG--SD-----GGVDSGSVAVAWDT--VKHLKFAVP--FDMK---PT	907
SEACUKE	ISLLE--SS-----SEELAEMAVAWDT--QKHLKFAVP--FDMK---PT	919
LANCELET	ACLVTGLT-----AEDLAKRAVAWDT--QKHLKFAVP--FDMK---PT	926
STARFISH	AYLLE--TS-----AEEIAKAVAWDT--QPLRFAPV--FVDMK---PN	926
SEA_URCHIN	VGLLE--TS-----AQELSNVALAWDS--QPLRFAPV--FVDMK---PE	930

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	LRFRQFLERLSTLQLSAPLEKSKLYVLLIQFAIYMIHQDQAVNCTKAVAQ-----NT	906
TETRAHYMENA	INLKLIPRMVLELNPPD-KIKVYVCAIHAIIIVMIQTQASSIQGGKRRGRDMENLI	963
STYLONCNCHIA	IYFDACLPRVVDLAKNSSDRETRVAACEFLHALLIYMIKKNASAPKGRGNQQQQ	935
APHANOMYCEsa	MSIEILLRMRDLNVTSIDRVPKAAACEAYHBMVLYLCKMTATLPTAK--THAS	865
APHANOMYCESe	IPISNILLHMKDLDLNTSIDRGIKSAACEYHBMVLYLCKMTATLPRSK--SSAN	849
PYTHIUM	LPLMKIFDIYGSLLCDSTDRRVKGAECYHBMASVLYLCKMTATNPHT----AG	918
PLASMOPARA	LALDSVLSHGLNLSQSSVSRVKSACEYHBMICYLCKMTATHPHT----SG	922
BREMIA	LAMNELSHLGTLLCKSSNRRLKVSACEYHBMALVCLCKMTATTHPHT----AG	917
AEDDES	TKLDTIIRVCAIDVNGSSDRKTVAACEFLHALLIYVIGIQYD-----	937
MIDGE	TFDNLTERVQDLNLSSEKRTTKVAACEFLHALLIYVIGIQYD-----	902
BOMBUS	THFDKILPRILLDQNSGDRKTVAACEFLHALLIYVIGIQYD-----	875
ANT	THFDMLPRILLDQNSGDRKTVAACEFLHALLIYVIGIQYD-----	902
WHIPWORM	LCDDFLPHLDDLNSAIERPLKVAACEFLHALLIYVIGIQYD-----	936
TRICHINELLA	LALDTLIPRLCDLNSAGDRPLKVAACEFLHALLIYVIGIQYD-----	936
BEEFLE	VYLDKILPRIVNVLNNSDRKTVAACEFLHALLIYVIGIQYD-----	891
BARNACLE	LWLETFLPRIVQLNLGSGDAQRTVAACEFLHALLIYVIGIQYD-----	901
THRIP	ISLDDLLPRIVHLNVCSDRKTVAACEFLHALLIYVIGIQYD-----	888
FLEA	IYLDKILPRINKLWLDNDRQTKVAACEFLHALLIYVIGIQYD-----	865
WHITELY	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	906
TICK	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	910
TERMITE	INLEKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	923
DAPHNIA	TQLDQFLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	863
OSTREOCOCCLUS	LWLDLILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	949
STERNOR	EDFKLILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	838
KLEBSORIDIUM	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	1021
CLUBMOSS	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	908
MOSS	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	972
LIVERWORT	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	987
LIGNANO	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	996
COPEPOD	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	907
GLOBOSUM	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	883
PALUSTRIS	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	931
NEOCALLIMASTIX	INLDNLLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	990
GLOMUS	ILFDEFLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	1010
LOBOSPOR	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	964
SYNCEPHALASTRUM	ISFDEFLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	944
FUNGIIVORUM	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	925
HALBUM	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	1042
DUPURPUREUM	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	1034
PVIOLACEUM	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	1011
AMPHIPOD	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	966
SHRIMP	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	939
MUDCRAB	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	936
TARDIGRADE	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	970
HYDRA	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	903
SALPINGOBECA	VOLDPMLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	953
SPIDER	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	959
LIMULUS	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	955
SCORPION	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	953
ROTIIFER	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	964
CIONA	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	947
OCTOPLUS	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	927
CAPITELLA	IYFDAPLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	951
LIMPET	IYFDAPLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	941
SCALLOP	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	972
LINGULA	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	958
OYSTER	IYFDAPLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	951
SNAIL	IYFDAPLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	953
SPONGE	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	960
PRIAPULA	IYFDVFLPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	969
DANTIO	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	967
ESHARK	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	958
BHARK	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	960
XENOPUS	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	975
STERLET	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	971
GAR	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	960
HUMAN	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	953
PLATYPUS	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	955
TASDEVIL	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	958
COELACANTH	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	961
CAECILIAN	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	962
CANARY	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	952
OSTRICH	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	922
GECKO	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	961
TURTLE	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	961
ALLIGATOR	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	921
APLYSIA	IYFDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	958
TRICHOPLAX	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	938
SOFTCORAL	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	951
STONYCORAL	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	969
SEA_ANEMONE	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	956
SEAUCUE	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	968
LANCELET	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	975
STARFISH	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	975
SEA_URCHIN	IYLDKILPRIVESHLSNDRQTKVAACEFLHALLIYVIGIQYD-----	979

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	KKKFEYANIYKMMVPMIFISNMLHPCRFVYKEHLTRIVHWFNISKOYE-----	956
TETRAHYMENA	KSKEPFSKIYKSLPTIFSIGSSHPSCLMNQLLILISRNFSNKSQLE-----	1013
STYLONCCHIA	-EVAPFAKIYKLLPVMHILATVBNISROLTEPLIFIVLRVFNSTVYD-----	984
APHANOMYCESa	-EKSVYDFHWGHTPSSLVQLAADTITRSLAPLALALLRWFSGIAALY-----	914
APHANOMYCESa	-EKSIYDHWANVTPSLVMLASDADTITRSLAPLALLRWFSGISSMY-----	898
PYTHIUM	-SKSAYFEVWASVSRLLILATDAEKVCRALTEPLLFQVITVFKSGSEFY-----	967
PLASMOPARA	-TKTFDFYLWREVFARVVRLASDEKICRSLTEPLLFOLLRLAINSDTY-----	971
BREMIA	-KKTFEYEMWREVLKRVMLATDPEKICRSLTEPLLFOLLRLAINSGSFP-----	966
AEDDES	---KMTKLWTKCDHLIQLATDTDIACVCMTEPLLFOLIIHVLQPSKIG-----	983
MIDGE	---ETPLLWKEICKRNLVILATDQDQTVARLLEPLLMMMHVPQPSQIL-----	948
BOMBUS	-NPDFQVSLYTMCCPALLNLGCDYBEAARHTIPVLMQLTRHWSKFMLE-----	924
ANT	-NRDKPTLYSTLCKAVWTLGCSSEVVCLEHPLALLMHWSSRRMP-----	951
WHIPWORM	-EKDSIAAMYGGKLLPALLQLTSPTEVPRRLSSLFGIVHLKPTTFAS-----	985
TRICHINELLA	-DRESISKAYSHLPVLLKLACDVEVPKMMSTLFVLIHLHSGTDFAN-----	985
BEEFLE	-SD--LDELLKXHVSLLRLCGMDQOVVELRPLCPFLIHWVHPFQSR-----	938
BARNACLE	-GS--LSAVYRRLPALLRLAASPVLVARLAPLLTITHWTTDAMSG-----	948
THRIP	-GH--LTSLVWHLPKFISLACDVIDIVSOLFKPLGELAHWVSSKLNK-----	935
FLEA	----LVHLYNTIPPTLLQLAADSDIIMQLFDPLMIQITHWFSQWKI-----	910
WHITEFLY	-NQ--TADVLKEMLPALLQLGSDSDVVRRLQHLVRFMMFVSSKFOAH-----	953
TICK	-AKFPMVHLFKHLPPELLHLACDVOVTRLRPLVQLLHWVSSGSTRG-----	959
TERMITE	-DKY--SELFRKLSLPLKLGCDPDPAPAIHRLNLVLIQLVHWVSSKFKLK-----	970
DAPHNIA	-LRYPLAPLAKIPTITLNLAAASDEIIRLRALLIQLVHWVSRPAFYRKGSSGPRTVL	922
OSTREOCOCCUS	-TESQYRPFPEKLEPIIFELAVDTEPVARLNSLSFPIVRRVARKQAQE-----	998
STENTOR	-LDFNFKLYNNVFPVYKLTATVVELLRMMEPSSKGLVRRVRSFSFE-----	887
KLEBSORMIDIUM	-FEYQFKYRKLPAKLLKATDVEPVTRLSSEFVGLIHWVSSRRTPE-----	1070
CLUBMOSS	-L-GNYVQLYRKLPSVYLWLATDVEPVTRLSSEFAMGLIHWVSSNTQKE-----	956
MOSS	-S-VHFDKIYKRLPAILRLATDVELVTRLLDFVKLIHWVTSNOOKE-----	1020
LIVERWORT	-S-VYLDKIYKRLPAVLR LAVDVOVTRLNEFVKLIHWVTSNLOKE-----	1035
LIGNANO	-DREQLLWRRLLPALLPLAAEDPVVKLQPLLMQLVHWVSRSEFE-----	1045
COPEPOD	-KKFPMTLEFRVFPVILKLCSDPSVIOQLFQPLFSOMIHWVTKERKCG-----	956
GLOBOSUM	-GRTPYHKLYKLPVLLRLSVDLKVTRLEPRLVLIQLVHWVTKNSKYE-----	932
PALUSTRIS	-KKSPPHNLKRVPGLLRLAVDLKVTRLEPRLVLIQLVHWVTKNSKAE-----	980
NEOCALLIMASTIX	-NTNIFNKPLYLFPVILRLSVIDIKISRLPSSLTFOLIHWVTSNLSND-----	1039
GLOMUS	-SQSPFYRYRKLPAKLLRLAIDTPVPRRLRRLVAGLIHWVTSNNAQE-----	1059
LOBOSPOR	-KKSPPHKLFLKLPALLRLAVDVOVPRLRPLVLSLIHWVTSNNAQE-----	1013
SYNCEPHALASTRUM	-TRSPYHRTYRVFPVLLRLAVDLSTPRMRSVLPFLIHWVTSNNAQE-----	993
FUNCTIVORUM	---DHSYRKYDHLPAKLLRLASDVEPVTRLEPLTMGLIHWVTRNLAE-----	973
HALBUM	---GGSFRLYRRLPALLRLAVDHWVARLSPILMLVHWVTRNVAE-----	1090
DUPURPUREUM	---SISFSRLYRKLPSLLCLSTDVEPVTRLQPLVPLIHWVTRNKKQE-----	1082
PVIOLACEUM	---EVSFSRLYKXLPGLLKLSTDVEPVTRLQPLVPLIHWVTRNKKQE-----	1059
AMPHIPOD	-ATRSPAPYRHLPAACLRLACDVOVTRLLEPLTMGLIHWVTSNNGYE-----	1015
SHRIMP	-LKEPMAPLYRHLPSAMRLACDVOVTRLLEPLTMGLIHWVTSNNGYE-----	988
MUDCRAB	-AKYPMALYRHLPSAMRLACDVOVTRLLEPLTMGLIHWVTSNNGYE-----	985
TARDIGRADE	-EKAILMDLINKLPKILLELACDVEPVTRLEPLSVOMVHWVSRTAQTA-----	1019
HYDRA	-QKLSMERLYKLPALIKLSCGQOVSEQLSPPLFLIHWVTRGSKYE-----	952
SALPINGOBECA	-GEDNLSPLYRHLPAVLRACDVOVTRLSPVLMGLIHWVTSNNSH-TE-----	1001
SPIDER	-EKYSMEALYKLPGLLELSCDVOVTRLSPVLMGLIHWVTSNCKVSS-----	1008
LIMULUS	-KYPMTKLYRQVFPALLRLACDVOVTRLEPLTMGLIHWVTRNNGLM-----	1004
SCORPION	-AIYSMKKLYRHLPAKLLRLACDVEPVTRLEPLTMGLIHWVTRNNGLM-----	1002
ROTFIFER	-QSYQMKLYRHLPSGLCLSTDVEPVTRLQPLVPLIHWVTRNNGYE-----	1013
CIONA	-SPHSMALYKXLPVLLQLACDVOVCKLFDPLIKMHWVTRNKKQE-----	996
OCTOPOUS	-YCFSEALYKXLPVLLQLACDVOVCKLFDPLIKMHWVTRNKKQE-----	976
CAPITTELLA	---NPMALYRKLPOMLKATDVOVSRLEPELMLIHWVTSNNSH-----	998
LIMPET	-KRYPMQLYKXLPAMKRLACDVOVAKLFEPLTMGLIHWVTRNNGYE-----	990
SCALLOP	-KRCSMAPLYKXLPVLLQLACDVEVAKLFEPLTMGLIHWVTRNNGYE-----	1021
LINGULA	-GRHPLDGLYRHLPAKLLRLACDVEVAKLFEPLTMGLIHWVTRNNGYE-----	1007
OYSTER	-ERYSMAPLYKXLPVLLQLACDVEVAKLFEPLTMGLIHWVTRNNGYE-----	1000
SNAIL	-KRNPMDSLYRKLPAKLLRLACDVOVTRLEPLVLMGLIHWVTRNNGYE-----	1002
SPONGE	---KNPMTKLYKLPVALQLACDVOVTRLEPLVLMGLIHWVTRNNGYE-----	1008
PRIAPULA	-SKRPMALYKXLPVLLRLACDVOVTRLEPLVLMGLIHWVTRNNGYE-----	1018
DANTIO	-SAPPMTKLYRQVFPALLRLACDVOVTRLEPLVLMGLIHWVTRNNGYE-----	1016
ESHARK	---QFTLYKLNQQLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1006
BHARK	---QFTMYKLNHRLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1008
XENOPUS	-GSSPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1024
STERLET	-STPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1020
GAR	-SSPMTKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1009
HUMAN	-GAPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1002
PLATYPUS	-GSPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1004
TASDEVIL	-GPPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1007
COELACANTH	-GVPMTKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1010
CAECILIAN	-SLPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1011
CANARY	-GPPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1001
OSTRICH	-GPPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	971
GECKO	-VSQPMSHLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1010
TURTLE	-GSPPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	1010
ALLIGATOR	-GSSPMYKLYKXLPVLLRLACDVOVTRLEPELVLIIHWVTRNNGYE-----	970
APLYSIA	-NKYPMERLYRKLPPALFALACDVOVCKLFEPLVLMGLIHWVTSNKMSE-----	1007
TRICHOPLAX	-SVTNYGNLYKXLPAILTLASDVOVSOQLQPLVLYLIHWVTSNKNYE-----	987
SOFTCORAL	-SKSPLKLYKXLPVLLQLACDVOVSOQLRPLFLIHWVTSNKNYE-----	1000
STONYCORAL	-KKSPEMLKXLPVLLQLACDVOVSOQLRPLFLIHWVTSNKNYE-----	1018
SEA ANEMONE	-VALPMQNLYKXLPVLLQLACDVOVSOQLRPLFLIHWVTSNKNYE-----	1005
SEAUCUKE	-SQSMVNLKXLPQALLHLACDVOVAKLFEPLVLMGLIHWVTSNKNYE-----	1017
LANCELET	-AKNPMTRLYKXLPVLLQLACDVOVAKLFEPLVLMGLIHWVTSNKNYE-----	1024
STARFISH	-AKSPMQHLYRRLPALFRLACDVOVAKLFEPLVLMGLIHWVTSNKNYE-----	1024
SEA_URCHIN	-AKSPMQHLYKXLPVLLQLACDVOVAKLFEPLVLMGLIHWVTSNKNYE-----	1028

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	APDVAQLLCLFQPIN-KED--PILPFCQLIGFPIQHLKQTPP---DQLKL---	1005
TETRAHYMENA	SPEVAELLLNIMNFISS-KDN--MLRELANCLGQPIKHLKQNTPE---QBIVK---	1062
STYLONCCHIA	HPEVESLLBALIDGASS-RNN--SQRDLCSNAVAEPAKSLKQMTD---KNIKE---	1033
APHANOMYCEsA	PFEAHAFLLDAMHGLSC-VDDGS--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	964
APHANOMYCEsE	PFEAQIFLDSLDIGISS-ADD--GGAREVQALSLSTFLKSLKQPPGS---	942
PYTHIUM	PHEYSRMLDELVLIGLSD-RTN--DVRVREYKCLAAACLSSEHAGL-----	1010
PLASMOPARA	PFEYSMLDELTRMSD-S-E--DVRVREYKCLAAACLSSEHAGL-----	1013
BREMIA	PFEYAGVWDLVSNFSD-P-E--DVRVREYKCLAAACLSSEHAGL-----	1005
AEDDES	LKGTETVLVCLMESISH-QTD--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1036
MIDGE	SSLTIVVILVEMEMISY-KKS--SGVDDSRLLREFILAVMRTNRRQOAS---	998
BOMBUS	SLTTTYFLDLDFKGLCC-EAN--SRLREPSICLSEFLKSLKQSDN---AAI---	971
ANT	---SPVILDLFDGILTD-DSN--DVRVREYKCLAAACLSSEHAGL-----	992
WHIPWORM	EATNVLVLLVLIIDNLCN-TTS--SSVRAQSLAYTEFLVSHMTPASRKE---ATH---	1035
TRICHINELLA	KMVTSCILLDTMDGLCC-FWN--SSLRDLSNYYISEYCRSHRXXVDSGGQ---NMR---	1035
BEEFLE	SGHEALVIBALLESMTN-PTD--PALRDFAKCLISEFVKHLKQSNK---LSK---	987
BARNACLE	RPESALLDVLLEGLVD-AGD--PARRDVSNADALREYLOSLKORRA-DP---V---	995
THRIP	SEQADAFLLDAILDGLTTH-QTD--MLRDYSMTCLHEFVVKSLKQGNM-M-----	980
FLEA	SIETSLLDLDMIGLISN-ETS--ASVRDISAKYLINEFVKSLKROADP-ED---LRS---	959
WHITEFLY	TNSVKVVFALMDGITN-PTD--SARVDFMRECIKGTQCAIKOSKS--S---NEK---	1001
TICK	SRESVAIVCELDWTVQ-PQE--TIVLKDFAKCLREPVQGIKOSTP-KE---LEK---	1008
TERMITE	SKEVELIITLMDGITN-PTD--PALRDFAKCLHEFVVKSLKQGNM-M-----	1014
DAPHNIA	GAEAALIVVEMESACRGLDA--SLVRDVAQSVATFLKSLKQPPPT---SR-AN---	972
OSTREOCOCCLUS	LDVTICLIFDAVLTGSSNSKA--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1048
STENTOR	NPETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	931
KLEBSORIDIUM	HPETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1117
CLUBMOSS	NPETMALLDAILDGLVD-AEN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1003
MOSS	NPETMALLDAILDGLVD-PDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1067
LIVERWORT	NPETMALLDAILDGLVD-AEN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1082
LIGNANO	GPYTALLDLSLDFRITASSGD--ASVRDVAQSVATFLKSLKQPPPT---SR-AN---	1094
COPEPOD	SLETNCLLVKLLDVTCE-DED--VSRDVAQSVATFLKSLKQPPPT---SR-AN---	1002
GLOBOSUM	NPETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	980
PALUSTRIS	NAETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1028
NEOCALLIMASTIX	DSESLIILDCCFSAIIC-QD--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1085
GLOMUS	NQETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1107
LOBOSPOR	NPETIVILLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1060
SYNCEPHALASTRUM	NPETIALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1040
FUNCTIVORUM	SEPTMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1021
HALBUM	NDETMAILLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1142
DUPURPUREUM	NDDTMNLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1131
PVIOLACEUM	SDDTMNLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1108
AMPHIPOD	HPDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1068
SHRIMP	NVDTMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1033
MUDCRAB	NPDTMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1030
TARDIGRADE	SAEATAVLDCVMDGLVS-EGN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1068
HYDRA	SPETIVLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1001
SALPINGOECA	REEVVLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	961
SPIDER	TPESAIVLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1055
LIMULUS	SEETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1053
SCORPION	SDETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1051
ROTIFFER	SSDTMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1062
CLIONA	SKDTMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1044
OCTOPOUS	NAESMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1022
CAPITELLA	RPDTEALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1047
LIMPET	SSETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1039
SCALLOP	SVETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1069
LINGULA	NPETAALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1056
OYSTER	SEESMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1047
SNAIL	SPESMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1051
SPONGE	SPDTVLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1057
PRIAPULA	SPETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1067
DANTO	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1065
ESHARK	SRTDVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1055
BSHARK	SRTDVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1057
XENOPUS	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1073
STERLET	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1069
GAR	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1058
HUMAN	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1051
PLATYPUS	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1053
TASDEVIL	SQDTMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1056
COELACANTH	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1059
CAECILIAN	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1060
CANARY	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1050
OSTRICH	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1020
GECKO	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1059
TURTLE	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1059
ALLIGATOR	SQDTVALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1019
APLYSIA	SPETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1056
TRICHOPLAX	SVETIALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1036
SOFTCORAL	SPDTIILLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1049
STONYCORAL	TPETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1067
SEA_ANEMONE	SPETIALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1054
SEACUCLE	SEETMALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1066
LANCELET	SEETITLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1073
STARFISH	SEETIALLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1073
SEA_URCHIN	SDETSTLLDAILDGLVD-EDN--GVRDVAQSVATFLKSLKQPPPT---SR-AN---	1077

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----NYSNIKTVMRRITTYANHPDFRYKSLLECIL-QVVKHTOKFK-FIVSKYFIE	1056
TETRAHYMENA	-----NHSNIKSALRRILISFSGPDLSKRFKALLALK-EVNNVNIKHS-FVLDKPFIME	1113
STYLONCCHIA	-----NPNNIKSLRRISISNHPDPFKRLSSVLCFS-KIFSVIRRH-PLIDRPFME	1084
APHANOMYCESa	-----TVPSAHALMERLALCGHLLSCRVAALAIN-HMYRDFRED-DLVRTYALS	1015
APHANOMYCESa	-----TSFSAHTLFRRLALSSHPVRSRGLGIMLVN-QFYRDFREDQ-EMVDIYALS	993
PYTHIUM	-----SVTKAEVLFHRLALCRHPGAERIGAAITME-YFLRSLNEENSAVIFSAFALR	1062
PLASMOPARA	-----PQIKAHYIFNRVSLCRHPGSVQRSGAAVSI-EYFLQSLREDEGALTRFAMP	1065
BREMIA	-----NCKRTDGFKRRLSLCRHPGAMQRSAAISIE-CFLRSLREDEGKTTSQCALS	1056
AEDDES	-----SSANLSVLEKRLRTFSLDINPNRRLGAAIAFN-NIYRILREED-AQIERCWFDF	1087
MIDGE	-----PIKLVDFLPELRKMSIETNVSRRIGAAIAFN-NIYRIVREDE-ALIDVYWIY	1048
BOMBUS	-----SQSMIKYVHKRINPALSPTSSTRKAGAPAFN-HIYSILREDE-KVTSIHWLE	1022
ANT	-----EHIKELIETLNLALHPTKRLGAAIAFN-HLMIYLRRED-DTISIHWLE	1041
WHIPWORM	-----RLDKADLVDRRLDMALHSNWTKRFAAFALNNGIVKTLRDNK-HCTDKYTTLE	1087
TRICHIANELLA	-----SESKVELLVQILITFAVHSSAVKAGAAVAFN-NLYKIIIRKR-WLVDIYILE	1086
BEEFLE	-----DPINIKLVKMLRPFYSMHPDSNKKLGAALIFN-SIYRDIRREL-SLLSMPFWE	1038
BARNACLE	-----QKVAPLLEALVGHLPDPYRRLGAAIAFN-NLYRVRRED-RLLDVFLLE	1044
THRIP	-----AKVAPLLEALVGHLPDPYRRLGAAIAFN-SMYAVLRED-KIVDEFWIE	1029
FLA	-----SSVNLEALISKICDYSINSSVHKQLGAAITFN-NLYMIFREED-NIVDQFVIQ	1010
WHITEFLY	-----VPLYIKGILSRINLYCVHPCKFKRLGAAIIFN-SIHSCLREBK-PILNEHWLE	1052
TICK	-----GPTNVQSVLRRLCSYCRHPSALKRLGAAIVFN-NLYVLLREDE-SLVDVFIID	1059
TERMITE	-----VNIKYVMKQIYSPCLHPCPSKRLGAAIVLN-SVYTVLREDE-SVVNQFWLE	1063
DAPHNIA	-----DPATPEFFLQKRLASATHPSHHQRHGAIVFN-KLYRVMRED-PLTSIYTLD	1023
OSTREOCOCCLUS	-----GSVNHFRILRALGLIGHSAEHLGAAITAFN-RCLKHIAKQ-FLIDEPVLK	1099
STENTOR	-----SLANFSPQSEKRLGAAIAFN-KILAPSLRE-VLIDREFLE	982
KLEBSORIDIUM	-----NFVNVTSMLRRLNRLDHPNPYRRLGAAIAFN-SLYPLVYR-CIVDRHFE	1168
CLUBMOSS	-----NFVNVTSMLRRLNRMHPSFYHRLGAAIAFN-QIYVILRNS-SIVDRYIFE	1054
MOSS	-----NFVNVRSMLRRLNRMHNPYRRLGAAIAFN-RMYPVLRNG-AIVDRYIFE	1118
LIVERWORT	-----DFVNIASMLRRLNRMHNPYRRLGAAIAFN-RIYVPLRNG-NIVDRYIFE	1133
LIGNANO	-----DSTASFYSRNVKSIKRVCLLALHPASSKRLGAAIAFN-AVYAQFRED-SLVNAFAFE	1151
COPEPOD	-----KNINIKTVLRLVYWKHPDIDGKRLGGSVFN-SIYRIFREED-KLVSEHLLV	1053
GLOBOSUM	-----NPINAKSLFKRLVLLCQHASSAKRLGAAIIFN-RIYTVFREED-ALVDQFVME	1031
PALUSTRIS	-----NPMNAKSLKRLVRLSLSSSHKRLGAAITFN-RIYRILREDE-SLVDQFVFE	1079
NEOCALLIMASTIX	-----LIENIEVLEKMIQYCRNPNYKRLGAAIIFN-KIYVLRREDE-KIVDKPLFE	1136
GLOMUS	-----SSMNMKSLKRLVNLCAHPDYTKRLGAAIAFN-NIYRIVREDE-YLVDQFVFE	1158
LOBOSPOR	-----SANVKSLLKRLVSLASHNPYKRLGAAIVFN-RIYRIVREDE-PLVNOFTME	1110
SYNCEPHALASTRUM	-----NPMNAKSLKRLVRLSLSSSHKRLGAAITFN-RIYRILREDE-SLVDQFVFE	1091
FUNCTIVORUM	-----NVGAVKGLFKRLVCLSRHPNPYRRLGAAIAFN-SSMEMKRES-ALVDQFAME	902
HALBUM	-----SAFNFKSLKRLVSLAAHPSAQTWGAASLAL-SLIRVMRED-NLISVPLFE	1193
DPURPUREUM	-----NAFNFKSLKRLVSLAHPDPFKRLGAAISFN-ELYRVRRED-SLVDQFPIE	1182
PVIOLACEUM	-----NPFNFKSLKRLVSLAHPNSHKRLGAAISLAL-ELYRVRRED-ILVNHPIFE	1159
AMPHIPOD	-----SAAHADAVHHLNLSVMKRIIHLMRHPSAFKRLGGCVAFN-AVYTEVREDE-TAVNVWLE	1126
SHRIMP	-----NSVSSNKSIIKRLVSPCKHPSAFKRLGGALAWN-SIYREIREDE-QAVDIWTL	1086
MUDCRAB	-----NQASLNLSLILKRLVSPCKHPSAFKRLGGALAWN-SIYREIREDE-LAVETWLE	1083
TARDIGRADE	-----PPAATALLERIVSYAGHSCAKRFGAAIAFN-HCYKTFREES-AVVDVFTID	1118
HYDRA	-----NPGNPRRLFKRMISLACHPNPYKRLGAAIVFN-NCYTVFREED-ILVNTFILE	1052
SALPINGOBECA	-----GGLVKVLLKRLVSMASHPNAPFORMGAAIAMN-NIYRILREDE-TLVDVYVCE	1100
SPIDER	-----PVERLLEKLSHPSLHPNSFKRLGAAITFN-SLYNVFRRED-FIVRKYTYLQ	1103
LIMULUS	-----SPVNIKALMKRLVSYCLHPNSFKRLGAAIAFN-HIYAILREDE-PLVNMFILE	1104
SCORPION	-----NPIGMNVFLKRLVSLHPNPYRRLGAAIAFN-SIYTVFREED-SLVDKFTLE	1102
ROTLIFER	-----SAPTFVNAKSLKRLVNFILHPNANKRLGAAIAFN-SVYTVFREED-SIVNRHIFE	1116
CIONA	-----VRNNAKSLFKRLVSLALHPTPMKRLGAAIAFN-HIYRVRRED-TLVDEPIFE	1095
OCTOPOUS	-----NPVNVISVLRVLYSYLHPDPFKRLGAAIAFN-NFYTVFREED-ILLDQFVFN	1073
CAPITTELLA	-----GPANPKRLKRMVSLLEHPSMMRLGAAIMFN-SIYSVFRRED-ALVDQFSLQ	1098
LIMPET	-----SPVNASSILKRLVSPALHPSVFKRLGAAIAFN-NIYQIFREED-SLVDRYTFQ	1090
SCALLOP	-----SPINAKSLKRLVSYALHPSAFKRLGAAIAFN-NIYTVFREED-TLVDTFTFQ	1120
LINGULA	-----NPHIPKSLFKRLVSPALHPSVFKRLGAAIAFN-HIYRVRRED-VLLDIFTFE	1107
OYSTER	-----SPINAKSLKRLVSYALHPSAFKRLGAAIAFN-NIYTVFREED-AMVNLVTFQ	1098
SNAIL	-----NPNVTSILKRLVSPALHPSAFKRLGAAIAFN-NIYVFRRED-SLVDRTTFQ	1102
SPONGE	-----SPMNTKSLKRLVSMGHPSTAKRLGAAIAFN-SIYTVLREDE-SLVDVFIIE	1108
PRIPAPULA	-----SPGNTKSLKRLVSLALHPSAAKRRGAAIVFN-NIYTVLREDE-MLVDTFIIE	1118
DANTIO	-----SPANKSLFKRLVSLALHPSVFKRLGAAIAFN-SMYRQFREES-SLVQFVFE	1116
ESHARK	-----SPANTKSLFKRLVSLALHPNVFKRLGAAIAFN-SLYRFRRED-ALVDQFPIE	1106
BHARK	-----SPVNTKSLFKRLVSLALHPNVFKRLGAAIAFN-SLYRFRRED-ALVQFVFE	1108
XENOPUS	-----SPVNTKSLFKRLVSLALHPNAPFKRLGAAIAFN-NIYRDFREED-ALVENPVFE	1124
STERLET	-----SPANTKSLFKRLVSLALHPNVFKRLGAAIAFN-SIYRQFREES-TLVDQFPIE	1120
GAR	-----SPANTKSLFKRLVSLALHPNVFKRLGAAIAFN-NIYQFREES-SLVDMEVFE	1109
HUMAN	-----SPVNTKSLFKRLVSLALHPNAPFKRLGAAIAFN-NIYRFRRED-SLVQFVFE	1102
PLATYPUS	-----SPVNTKSLFKRLVSPALHPNPFKRLGAAIAFN-NIYRFRRED-SLVDQFVFE	1104
TASDEVIL	-----SPVNTKSLFKRLVSPALHPNAPFKRLGAAIAFN-NIYRFRRED-ALVQFVFE	1107
COELACANTH	-----TPANTKSLFKRLVSYALHPSAFKRLGAAIAFN-NLYKFRRED-ALVDKPVFE	1110
CAECILIAN	-----SPVNTKSLFKRLVSLALHPNAPFKRLGAAIAFN-NIYRFRRED-ALVDQFVFE	1111
CANARY	-----SPANTKSLFKRLVSLALHPSAFKRLGAAIAFN-SIYRFRRED-SLVQFVFE	1101
OSTRICH	-----SPVNTKSLFKRLVSLALHPSAFKRLGAAIAFN-SIYRFRRED-SLVQFVFE	1071
GECKO	-----SPVNTKSLFKRLVSPALHPNAPFKRLGAAIAFN-SIYRFRRED-ALVDQFVFE	1110
TURTLE	-----SPVNTKSLFKRLVSLALHPNAPFKRLGAAIAFN-NIYRFRRED-SLVQFVFE	1110
ALLIGATOR	-----SPVNTKSLFKRLVSLALHPNAPFKRLGAAIAFN-NIYRFRRED-SLVQFVFE	1070
APLYSIA	-----NPINAKSLKRLVSMASHPNAPFKRLGAAIAFN-NIYVFRRED-ALVDRTTFQ	1107
TRICHOPLAX	-----TSNNAKSLKRLVSLASHPSAIKRLGAAIAFN-NIYVFRRED-TLVDTFPIE	1087
SOFTCORAL	-----SPINIKSLFKRLVSLATHPSANKRLGAAIAFN-NIYRFRRED-SLVENFTIE	1100
STONYCORAL	-----SPINIKSLKRLVSLALHPSASKRLGAAIAFN-NIYTVFREED-SLVDIFVLE	1118
SEA ANEMONE	-----SPINIKSLKRLVSLALHPNASKRLGAAIAFN-SIYTVFREED-SLVDVFLLE	1105
SEACUCU	-----SPINTKSLKRLVSMALHPSALKRLGAAIAFN-NIYTVFREED-SLVQFVFE	1117
LANCELET	-----SPINIKSLKRLVSLALHPNPFKRLGAAIAFN-SIYRDFREES-SQVDMFTFE	1124
STARFISH	-----SPINTKSLKRLVSMALHPSVFKRLGAAITFN-HIYTVFREED-SLVDQFVCE	1124
SEA_URCHIN	-----SPINTKSLKRLVSMASHPNAPFKRLGAAIAFN-SIYTVFREED-SLVDQFVFE	1128

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	IIVQLKPIPIVEDKDI-----SR-IVSNTNNI II IIIS II PERF--TQDLLQ-	1099
TETRAHYMENA	TIQTSMRIVQKT---G-----VSNEVEDNFNLIKLOT II IQKN--YKTLKA-	1155
STYLONCCHIA	IAHNVLSGLKMCNHSIE-----FSQEVINDCIMMLEKRVKVVQRK--ISILMN-	1130
APHANOMYCESa	MAKNVLVALKPPDDPNAVL-----PLVHALAHMEKILVVR--AADLQH-	1056
APHANOMYCESa	IQYLLLAALKSEG-SDSAL-----SLHHAVDHMEKIIILKS--APTLOH-	1033
PYTHIUM	CMKNLLYSRLCCDDWSGGGNEATD-----IAQEIITAKAILLQORASRF--SSLFPS-	1112
PLASMOVARA	CLKNLLYALRLCCSDAQYQIGDD-----VAREIMLANAVMKIERGICRF--PHLPLS-	1115
BREMIA	CLMNLLYALRLCCDRDAKNRIGGVV-----ISHDVITKAVLKERGICRF--SHLFLN-	1106
AEDDES	LFYVFCMNFVMTEDF-----D-----GSTTNLEQVSATIDHLVRLVVR--KVVFN-	1132
MIDGE	LLDTFAINFKNSDEF-----SVNLDNSEQEIQITATMSHLTRVIVR--SDIFHR-	1097
BOMBUS	LLYSFKSLDGCSDP-----SIIANLHVPERVLIAR--KNLLMA-	1059
ANT	LFYSFVCSLDGCNDL-----SITNALSHKRVKVVK--ANLMT-	1078
WHIPWORM	LFVFLMRLSLVATEK-----E-----DYGVVEEBCVKALGRLEMLVRY--VALFOA-	1132
TRICHINELLA	MFPTMKSLYLAEND-----D-----ELYGVDECKQAIKIRRIILHN--LMDLQI-	1131
BEEBLE	LIHIFVKSFSLEND-----G-----IDENLVQINNALSRLEGFVEK--SDFLNN-	1083
BARNACLE	VTAALLAALARAHAD-----P-----SALGTTAAADALGHORILAAAR--ASHLLE-	1089
THRIP	LLYGLVTLSSCSIT-----G-----EDSSAEAHIDKSLQVLRVLMEC--SNKFNL-	1074
FLEA	LSTYFVQSMVNDKH-----T-----NI-----QOLEETLNHLMRVIVEK--SDFN-	1051
WHITEFLY	LMYYLLKNLSSEEN-----N-----DC-----SDQLRSALRIILRVFEKEEPRKMLNS-	1096
TICK	ILAHFVDSLKAHSD-----E-----RTIGTRELSCALDVLRIIVSTK--SELLNR-	1104
TERMITE	LLYHMMNLSLSEET-----D-----SILGGQEVVTVANHIERVLEK--ASLFNK-	1108
DAPHNIA	LLTHFVTSLSLGERD-----P-----FSSEILHQSQUALYHLITVNLK--RNIFEH-	1068
OSTREOCOCCUS	MLDVTLSKMSRSDEHAAG-----K-----SMRGADVAMAVLQELHIIQAN--ANRLLS-	1147
STENTOR	FMDVFTRLSHYD-----S-----SSEETLDYCKTTLNHLKALBNK--FSVFCV-	1027
KLEBSORIDIUM	LFYCAKSLRLAERD-----S-----ETIGTVRQMSRVRHDLKRVKRF--YDPLKY-	1213
CLUBMOSS	LAPFLKSLRVGDDT-----A-----BOIGTIKQAYKALDLEKLIIVRN--ISLLQK-	1099
MOSS	ILFFCIKSLKLGELD-----D-----EQIGTMKQNKTELLQRLVTRN--ITLLEK-	1163
LIVERWORT	ILFFCVKSLRLAESD-----D-----VOTGTAKOVNKTLEVMKLVERN--ISALQR-	1178
LIGNANO	LLHCFMRSIQLADAD-----D-----ASLGTVEQCNLALDHLERIMVER--AATLKV-	1196
COPEPOD	LLSSIFPAKISSHND-----P-----LFCGTSASLQNLHLKRIIFHY--LPLFQT-	1098
GLOBOSUM	LLYHLLFSLKISDRD-----N-----PALGTALVIAIDMAKIVVVK--HELFLA-	1076
PALUSTRIS	LLYHLLMALAEND-----H-----TGLTQQTIRKGVHLLKIIKSK--SDFLRS-	1124
NEOCALLIMASTIX	ILYYILYNLKLSSYD-----K-----DEIETTEQCKVAINHIIIRILKVK--YSIFLM-	1181
GLOMUS	LLYWMVNLRLSDND-----Q-----SATGTROQAISATIRHLKIIIVK--SNLFLN-	1203
LOBOSPOR	LLYWLLFSLRLAETD-----H-----SGLGTRHQACLAIRLQRIIVQVK--AALFLK-	1155
SYNCEPHALASTRUM	LLYWMLFSLRLAUSD-----H-----PSLGTREQSKAISHKRIIREK--APAFLE-	1136
FUNCTIVORUM	ILHMHVTRLCRHD-----D-----WSLGVAEKARVIMDLORVIBAS--AKVLVK-	1117
HALBUM	IAHQVLSMRLCGVADEGDDTPTT-----LEVEVEKGLQAVDANVIVIERR--AELLNR-	1246
DUPURPUREUM	ILHNIFFSLRIGDDNSSD-----D-----SIVEISSKYTVLVALTVIVR--ATMLNK-	1230
PVIOLACEUM	IMHNLFSRLRIGDDNADD-----D-----SIEIASKFSNVLVALTVIVR--ADLNN-	1205
AMPHIPOD	LFAAVALCTLAADK-----H-----AALPCAALASTSLRILCRATHY--KNLFNA-	1171
SHRIMP	LLAHLMTSLDLAQVD-----D-----PALGTHEQTKSAINHIERIIRVK--SDFQK-	1131
MUDCRAB	ILSHLMSALDLAHD-----D-----LVLTGHEQTRAAILHVRRIILVR--KELFWK-	1128
TARDIGRADE	LIVTFTKSLALCHRD-----P-----PGFGSTRKAVELLLHLARIVKEY--AKTLIS-	1163
HYDRA	LLLVYINGLSLSHKD-----E-----KSPGSDIQVELSLQHEKIIKVK--CDILLK-	1097
SALPINGOECA	ILTDVFMRSIQLAHRD-----D-----PAMGTATHTERVTLNLRILKVK--ADKFR-	1145
SPIDER	ILVLFVDSLALAHFD-----S-----SSLTQEQCVNALHLEKIIIVVK--HSLFIK-	1148
LIMULUS	TLVHFVNSLALAHKD-----E-----KSLGTQEQCKQALDHLERILRVR--AELLNK-	1149
SCORPION	IAVHFIESLALAHYD-----D-----KILGTQEQCKQALDHLERIMRVR--AKLLSK-	1147
ROTIFFER	ILFYLESLSLMSEND-----D-----KMGFTQEQCKGLDHLERILKVK--SOLLQ-	1161
CIONA	TLVTFINSLSLSHVD-----E-----MFIGTKVCKQALEHIERIISVK--SMLCK-	1140
OCTOPUS	LLVHPVKSALCHKD-----D-----QSLGVNSQCKALDHLERILKVK--ADMLKE-	1118
CAPITELLA	ILSVLVNSLALAHRD-----D-----KSLGTQEQCKSALLHLERILKVK--QVTFNK-	1143
LIMPET	ILVHFVESLALAHKD-----D-----KSLGTQEQCAVALHLERILKVK--EDILK-	1135
SCALLOP	TLVHFVESLALAHKD-----E-----KSLGTQEQACKALEHLEKIIICK--ADILRK-	1165
LINGULA	ILVTFIESLALAHHD-----D-----KSLGTQEQGVQVNLHLERILVVK--AALLCK-	1152
OYSTER	ILVHFVESLALAHED-----E-----SSMGTQEQCKMVDHLERILRVR--ANVLSK-	1143
SNAIL	ILVLFVESLALAHQD-----E-----ASLGTQEQCKKALEHVEKIVCKR--VDILRK-	1147
SPONGE	MLVVMVNSLALAHKD-----A-----QSIGTVQCCSLDHLERILKVK--SSTCLSK-	1154
PRIAPULA	ILVTFVDSLALAHND-----E-----KSLGTQEQCAQALDHLERILRVR--AHLNKK-	1163
DANTIO	VLVVFVESLALAHFD-----E-----KSVGTVQCCSSLDHLERILKVK--ADSLN-	1160
ESHARK	VLVVVFVESLALAHAD-----D-----KSLGTVQCCDAIDHLERILKVK--ASALN-	1150
BHARK	VLVVVFVESLALAHAD-----D-----KSLGTQCCDCIDHLERILKVK--AHLN-	1152
XENOPUS	VLVIVMESLALASHAD-----E-----KSLGTTQCCSDANDHLERILRVR--AASLN-	1168
STERLET	LLVIVVESLALAHAD-----E-----KSLGTQCCSDAIDHLERILKVK--AASLN-	1166
GAR	ALVIVVESLALAHSD-----E-----KSLGTQCCSDAIDHLERILKVK--AATLN-	1153
HUMAN	ALVIVMESLALAHAD-----E-----KSLGTQCCDAIDHLERILKVK--HVS LN-	1146
PLATYPUS	ALVIFLESALATHAD-----E-----KSLGTQCCDAIDHLERILKVK--HISFN-	1148
TASDEVIL	ALVIVMESLALATHAD-----E-----KSLGTQCCDAIDHLERILKVK--HITLN-	1151
COELACANTH	TLVVVYESLALAHMD-----E-----KSLGTVQCCDAIDHLERILKVK--APSLN-	1154
CAECILIAN	ILVVVYESLALASHQD-----E-----KSLGTVQCCDAIDHLERILKVK--APSLN-	1155
CANARY	ALVVVLESALAHAD-----E-----KSLGTQCCDAIDHLERILKVK--APSLN-	1145
OSTRICH	ALVVVLESALATHAD-----E-----KSLGTQCCDAIDHLERILKVK--APSLN-	1115
GECKO	ALVVVLESALTHGD-----E-----KSLGTQCCDAIDHLERILKVK--ASTLN-	1154
TURTLE	VLVVVLESALATHD-----E-----KSLGTQCCDAIDHLERILKVK--ASALN-	1154
ALLIGATOR	ALVIVFESLALATHD-----E-----KSLGTQCCDAIDHLERILKVK--APSLN-	1114
APLYSIA	ILVNVFVESLALAHAD-----E-----KSLGTQEQCKSALLHLERILRVR--VDMLEK-	1152
TRICHOPLAX	ILVNVVNSLALSHTD-----E-----KSLGTQEQCKSALLHLERILKVK--ASTLN-	1132
SOFTCORAL	ILVTVLESLEMAHED-----E-----ISLGTQEQCKSALLHLERILRVR--SSVLLN-	1145
STONYCORAL	ILVNVLECLCSLHGD-----E-----EARGTQEQCVQVNLHLERILKVK--AQLLVK-	1163
SEA ANEMONE	ILVTVLESLALAHAD-----D-----PAQGTQEQCKSALLHLERILKVK--ATLDDK-	1150
SEACUCU	ILVATFVQSLAMAHHD-----A-----KSLGTQEQCKSALLHLERILKVK--ANILNK-	1162
LANCELET	ILVTVFVESLALAHHD-----E-----KSLGTQEQCKSALLHLERILKVK--ADLNNK-	1169
STARFISH	ILVTVFVNSLALAHHD-----D-----KSLGTQEQCKSALLHLERILRVR--ADMLNK-	1169
SEA_URCHIN	ILVVFVESLALAHHD-----D-----KSLGTQEQCKSALLHLERILRVR--AALLNK-	1173

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	E-MK-GROCK-----NK-----TLYSLHEFLI-NEAM-IGKDGGMQAALSLWYLV-	1142
TETRAHYMENA	K-NE-NRSGQ-----FK-----LDSLLDKLYSY-GF-PNNSYLVRKSPELWOSIL-	1198
STYLNONCHIA	V-NP-KRSIH-----QS-----VFTF-----ILYLFKEP-VAIEVTKRRESMKLWEAIV-	1171
APHANOMYCESa	D-DD-TRVVLGG--TDCL-----NLNAFTTWLFS--NV-ASSAPPTFRSNLRLFEOLA-	1102
APHANOMYCESa	E-NP-DRMLLGG--SGCL-----NLSEFTSWLFS--NI-ANASPDPRNRKDKLFTLS-	1079
PYTHIUM	S-QN-----EEE-----NLKSLTTLVLFH--QC-SRPESSYRRMQRPLMFAFA-	1150
PLASMOPARA	D-SS-T--TYSI--DNDY-----TLHQMTQLFQ--QT-GAREQSFRLRRIFLFSFS-	1159
BREMIA	E-NI-S-S-----KGT-----LQOQTTEVLFH--HS-TAPEVLFQRLRRIFMSFS-	1146
AEDES	E-SS-VRIVPRVF--GGS-----LLKDLVLLVLFH--QC-SSRESSYRHKMEVFPKLT-	1178
MIDGE	A-ST-ERIRPNPF--EGK-----TLIDVLRKLFKESGC-HOHHSRYRHMMEVFLKIL-	1145
BOMBUS	E-HH-NRRKPYEF--EGS-----TLVDVAVRLLT--QC-GCLDQCRKIKMELVVKLS-	1105
ANT	LMS-RRKPEF--DNA-----TLYALVLLS--QC-CTYDEHCRAKMELVWVLS-	1125
WHIPWORM	P-SS-VRKPRDW--KAA-----TLYCCLDLLE--EM-GRPVSSFTVTLTAVSNIT-	1178
TRICHIANELLA	H-NV-QRRTPNEW--SQS-----TVHCCDMLLN--TM-TWSNYQFSEEFISYOELT-	1177
BEEFLE	L-DT-QRRIPNEF--NGG-----KLADVAVRLLK--QT-GVKNHDCRTPKQRIEPCSL-	1129
BARNACLE	K-SE-QRRVPAGW--OGA-----TLPDLLSLVH--QC-GAPQTECHRAQYRLEALT-	1135
THRIP	D-SP-SRRIPREL--TGR-----NLWVVRVLLK--YC-TALNSQCRSHMKLVDCIA-	1120
FLA	D-SG-HRNIPQVL--NGC-----LKHVTVLFLK--HC-GFVENHCRKRMEMFLKLA-	1097
WHITEFLY	R-NP-NRKKPEF--EDE-----TLQGATLWLLK--QT-SSPSIVCRTEVMLFORFA-	1142
TICK	P-NV-KRKPWSDTGGEPV-----VLSTAVRLLL--QT-SRPQADCRHKMELVHALI-	1152
TERMITE	E-DN-IRKKPEF--EGI-----LLKDAVSVLLK--KC-GTVQVQCRHKMELVYVLA-	1154
DAPHNIA	P-DS-RRVAPFL--TQG-----TLPEDLDLILN--HA-LGSQRCHQIIELELGLIA-	1114
OSTREOCOCCLUS	S-PG-SKATE-----SVLEFLOVLE--LT-MSSDEFTFRKQKVPDVA-	1187
STENTOR	S-ND-KRTHK-----DLSELEWLE--QC-KRPERVARKQDHWKTLIS-	1068
KLEBSORIDIUM	P-RKQRPMPA-----TLQELQVLFH--QT-GRPQRCQOQHLLSALSA-	1255
CLUBMOSS	N-KK-DRVLCF-----TLEDFTWLFH--QT-KLSHERCRKQKALLSAVC-	1140
MOSS	K-RK-DRPLFL-----ALDDFLQVFE--QT-RLHGRSRTKQMLFCSIC-	1204
LIVERWORT	S-RK-DRPMLF-----TLDDFLEWLLH--QS-GQLQEACRSRQMLLSYIC-	1219
LIGNANO	E-SQ-QRRTPGLS--KWT-----SATLEVAVRVLV--QC-GOPESACRAAMRLVNDGS	1245
COPEPOD	N-PG-QRRIPVGF--SGG-----TLAHILDWLLD--LT-FLQTEARHAMTYLHEIC-	1144
GLOBOSUM	T-TS-SRRSPDL--PNC-----NLGTVTRWLFH--QS-KHKELEYKQIELDFKFA-	1122
PALUSTRIS	S-KS-TRRSFPGF--KEA-----DLGGLVDWIFA--EI-GRLEIYTAQQMOMVFMELA-	1170
NEOCALLIMASTIX	S-KE-SRRHFPGL--ENT-----DLKSLVEWLLH--ET-GALEIYVSKTMDLFLILN-	1227
GLOMUS	D-TP-RRRKPFL--NRS-----DLSLVEWLFH--ET-SRKEQDYSSMRLEFGEV-	1249
LOBOSPOR	D-SK-DRRIPGL--EEA-----TIDGLVHMLLR--ET-SRPEMEYKIKRMLPDSFV-	1201
SYNCEPHALASTRUM	P-AS-QRRTPPGL--EEP-----TLQETVAVSFG--EV-GQLERDARSKMDFPNEFV-	1182
FUNCTIVORUM	V-NR-KRHEE-----DLRGLVEWLLH--NI-GRQEMSRVQDSTETLIS-	1158
HALBUM	T-NN-NRREHK-----DLADVGVNFG--EV-GRMERRYKPTIHALGRVIV-	1287
DPURPUREUM	T-QQ-SRREHK-----DLSHVQVLFQ--VGCSRAESVRYEMLMFSQLV-	1272
PVIOLACEUM	P-DT-SRREHK-----DLSDFVSNMK--DCCSRPENIARYESMQLFIQV-	1247
AMPHIPOD	R-SE-MRRIPDCL--TGS-----DGTAAALTEMLR--LC-GHRASALRHATASLPGA-	1219
SHRIMP	K-SG-QRRLPFGF--G-----DGTLDVVLKWFH--QC-GRPKALVRHTMELLASLA-	1177
MUDCRAB	M-SS-NRRIPDF--E-----GGTFEDMLWLE--QC-GSPKTLVRHMSMELLESLA-	1174
TARDIGRADE	T-AS-RRVVPVFL--DEGKLEKATLEKLTWMLM--QA-CRPELACRMSWALVGRFL-	1215
HYDRA	P-FK-NRRHPQF--KDTT--DFNLRHVMWLLS--EC-GSPQACRHKMELFISFM-	1146
SALPINGOCEA	T-SR-VRRIIPGW--ETC-----TLAEMTRWLT--HA-CDLHAAVRHKMAFPLHLA-	1191
SPIDER	S-EK-SRKKPECL--EEA-----TLQCTVLLK--QC-GCVQTECRHKMDLVKFA-	1194
LIMULUS	P-SK-QRRIPQCL--DGT-----TLSAAVLLVQ--QC-GKPQTECRHKMELVFKLA-	1195
SCORPION	T-SK-KRRPLRMT--NDS-----LLEPVEWLLK--NC-GCLQTECRHKMELVFLA-	1193
ROTIFFER	T-OP-KRVPKPGW--SEP-----VLEAVRMLR--QC-GRPTECRHKMELSHKLA-	1207
CLONIA	P-SD-IRRTPRCF--TNTT--SITLSMIVEWLFH--QC-GRPQTECRHKMELHHEFI-	1189
OCTOPOUS	V-SS-ARRQSQW--NQI-----TLYAIRMLVR--QC-GRPQTECRHKMELVYNLA-	1164
CAPITELLA	D-SK-QRIKPRGW--RDA-----NMTTAVRMLLR--QC-GRPQTECRHKMELVQOLA-	1189
LIMPET	P-SK-IRQEPREW--SNK-----TLDIARVLSR--QC-GRPQTECRHKMELVYNLC-	1181
SCALLOP	E-SK-LRTEPSQW--SKI-----TIDICVRWMLR--QC-GRPQTECRHKMELVHKMT-	1211
LINGULA	D-SK-IRRKPFTW--NKA-----TLDICVRMLLR--QC-GRPQTECRHKMELVYKLA-	1198
OYSTER	E-DK-NRTEPKQW--SVV-----KLDIARVMLR--QC-GRPQTECRHKMELVHOLA-	1189
SNAIL	P-SP-HRKEPSEW--SKQ-----TLDIARVMLR--QC-GRPQTECRHKMELMYKLA-	1193
SPONGE	A-NK-NRRVPRGL--KSA-----DLSILTAVLLA--QC-GSIETEARKMQRKLVOLA-	1200
PRIAPULA	D-KK-SRKRKPEF--TDA-----TLPTVVGWLLQ--QC-GRPQTECRHKMELVCKLS-	1209
DANTIO	L-NS-KRRIPRGF--PADQ--SVCLSNVWLLT--QC-GRPQTECRHKMELFFEFV-	1209
ESHARK	K-PI-KRVPKPGF--PPDQ--PVSLDVMWLLV--QC-GRPQTECRHKMELVYELV-	1199
BSHARK	K-PV-KRVPKPGF--PADQ--MVCLFDVWMLLT--QC-GRPQTECRHKMELFFEFV-	1201
XENOPUS	K-AT-KRRIPRGF--PQGN--TVCLFDVWMLLE--QC-GRPQTECRHKMELFFEFV-	1217
STERLET	K-TS-RRVPRGF--PPDK--PVCLLDVWMLLV--QC-GRPQTECRHKMELFFEFV-	1215
GAR	K-SS-RRVPRGF--PPDK--PVSLDVMWMLLV--QC-GRPQTECRHKMELFFEFV-	1202
HUMAN	K-AK-KRRIPRGF--PPSA--SLCLLDVWMLLA--HC-GRPQTECRHKMELFFEFV-	1195
PLATYPUS	E-EK-NRRIPRGF--PNAR--SVRLDVMWMLLV--QC-GRPQTECRHKMELFFEFV-	1197
TASDEVIL	K-PK-KRRIPRGF--PPVQ--TLCLLDVWMLLA--QC-GRPQTECRHKMELFFEFV-	1200
COELACANTH	K-AA-TRRVPKPGF--SPDK--VFCLSDVMWMLLV--QC-GRPQTECRHKMELFFEFV-	1203
CAECILIAN	K-TL-KRRIPRGF--PSTK--SSVCLSDVWMLLV--QC-GRPQTECRHKMELFFEFV-	1205
CANARY	K-EG-KRRVPRGF--PPTK--SVCLDVMWMLLV--QC-GRPQTECRHKMELFFEFV-	1194
OSTRICH	R-AG-KRRVPRGF--PATK--TVCLLDVWMLLV--QC-GRPQTECRHKMELFFEFV-	1164
GECKO	K-ES-QRRIPRGF--PAK--SICLEDVWMLFL--QC-GRPQTECRHKMELFFEFV-	1203
TURTLE	K-AE-KRRIPRGF--PNAX--SVCLLDVWMLLV--QC-GRPQTECRHKMELFFEFV-	1203
ALLIGATOR	K-AE-KRRIPRGF--QPAE--SLCLLDVWMLLM--QC-GRPQTECRHKMELFFEFV-	1163
APLYSIA	D-PG-LKVRPEP--SAWS--SRKLEFAVRMLR--QC-GRPQTECRHKMELVYNLC-	1200
TRICHOPLAX	E-SK-NRRTPGTF--MTK--TVTTHVWMLVR--QC-GRPQTECRHKMELVYGLA-	1180
SOFTCORAL	V-NK-KRRVPRGF--SAD--TTTLRHLIPVLR--KC-GCSQTECRHKMELVSVLA-	1193
STONYCORAL	E-NH-KRRIPRGF--ASQS--SITLHMLIPVLR--QC-GRPSSECRHKMELVSKLA-	1212
SEA ANEMONE	E-NK-QRRIPRGF--QMLD--SITLSHLIPVLR--LC-GKPQTECRHKMELVQVLT-	1199
SEACUCU	E-NK-HRRIPRGL--PGN--CKTSLHLLVLLN--QC-GSPQTECRHKMELVFNLS-	1210
LANCELET	H-SK-VRVPRGF--DRES--PPTLPLDVTWLLQ--QC-GRPQTECRHKMELVCSFL-	1218
STARFISH	E-SK-IRRIPREF--PAGV--CPTLSMIVWMLLR--QC-GRAQTECRHKMELVYKIT-	1218
SEA_URCHIN	E-SK-NRRVPRGL--PEDC--SPTLSHMVWMLT--QC-GRPQTECRHKMELVYGLT-	1222

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----SKTQKVI---KKNARELLV---DQIAEI--GQMKLFP--KYPINRL	1179
TETRAHYMENA	-----NRESDI--S-----CK--KFLAKR--KQGDNL-----	1220
STYLNONCHIA	-----RCIPPTN--IENMPDNPKVWIFSYLYQR--RGEKAIK--RPAKISF	1212
APHANOMYCESa	-----RMVN---M-TGS---CKAWLQPOKQNH---SAAQLQY--ILAPPAL	1136
APHANOMYCESa	-----RMVG---M-TGS---CKEWLQYQKSH---TVGQLD--VLAPQEL	1113
PYTHIUM	-----AIVN---GSS---CKKWIQAHASTE---GCDRIVE--ILAMPDN	1183
PLASMOPIRA	-----ALIS---T-S---TTEWMHNYETVQ---ERKSILA--VMVPLSA	1191
BREMIA	-----VLVD---K-S---IPEWMQSYELKH---SGESIIG--VLVPIA	1178
AEDES	-----SSVD---G-CRS---AAEFVGEYLSQD---EILDICD--HVDTV--	1210
MIDGE	-----P-----V-CGV---KEEICGKILNVE---KILVV-----GER--	1170
BOMBUS	-----EHVA---D-CDS---AKTINNYIDY---GIETPNS--IILSQLP	1139
ANT	-----QDIG---S-YA---QETQNFVQIY---GIMRLND--IILKGLE	1157
WHIPWORM	-----AS-L---K-MDH---PODYSSDMKR-----ITE--HFESRHL	1206
TRICHINELLA	-----DAEI---E-KLH---FLRHIGTIFG-----FID--HFESHR	1206
BEEBLE	-----SKCK---G-YTN---MQNFINSHPDGS---WM---RD--IYETY--	1158
BARNACLE	-----PLAP---A-AGG---LRGLVAA---GG-GA---VR--LLEHA--	1161
THRIP	-----RVVS---D-CRS---TKDFIESVISIE---GNCSLL--VABGETS	1154
FLA	-----VLVD---E-INT---AHMFIMQNTGNF---VIKSVIE--IGECSTN	1131
WHITEFLY	-----SFLP---G-FIS---ASNLYNLSLSTE---GEDFVSN--LVEEN--	1174
TICK	-----PKLP---G-APS---HQSYMSLLQGN---SPGFVVE--SPEGNLA	1186
TERMITE	-----PLLP---V-CKS---GSEFVSWYAATH---SWTISIIR--ICEGSKS	1188
DAPHNIA	-----RP-----QS---LAEVMI-----QFFSRQPLESHL--	1136
OSTREOCOCCLUS	-----PISV---SD---TSEWQARSHLVS---SSDALVP-----	1214
STENTOR	-----LISK---YN---LNAWSEPEWQK-----	1086
KLEBSORIDIUM	-----PESA---E-GS---AAVWFRSKLSPS---TPLEALLE--PFDVQHP	1289
CLUBMOSS	-----SALP---G-GS---CMHWFRPRTGT---QRLHMLAG--LPEKLP	1174
MOSS	-----LSIP---G-CS---SAHWFRANICSG---DQVSVTVK--QPDVMD	1238
LIVERWORT	-----RLLP---A-GS---LASWYRSKLDHG---ADMESIIG--VFNVEE	1253
LIGNANO	PTDRRSRVGGLARCLLTSSEPKRQOATAASPRQFFOALLKQF---KANYFYD--RWERFOP	1301
COPEPOD	-----RRTSTS--A-AQP-----ILEKFG---TINKLIL--RVEHALT	1174
GLOBOSUM	-----SRMT-----G---VVSMMKNIQTNN---ERYVFD--LFLKLP--	1150
PALUSTRIS	-----PLIS---T---PKFVRSRSSSK---PTFIPD--ILERTNL	1200
NEOCALLIMASTIX	-----PLLP---E-NSK---IG--LNLFLANN---NNLFND--IYKVEL	1258
GLOMUS	-----KLLP---D-FKT---GFRWVKARIDRD---PKFLES--LYKNSL	1282
LOBOSPOR	-----KLLP---G-SPS---SGTWIGAKITHN---AGFVAS--LYQCPQY	1234
SYNCEPHALASTRUM	-----VTLP---G-IHS---AKDWLQERYARD---DDYITN--ILETQRL	1215
FUNCTIVORUM	-----VCLP---G-IHT---TEQCVRFSSTQ---SGTTHVLR--SIQPY--	1191
HALBUM	-----QLLP---G-OKR---ANLWIQOVQK---HGLAALIK--MAEPPT	1321
DPURPUREUM	-----VLLP---S-KKT---PLQVVKDHVNT---NGLSPIIS--VAEPRT--	1305
PVIOLACEUM	-----VLLP---G-IKT---PIQWIKKQPL---DQY--LIS--IAESQAV	1279
AMPHIPOD	-----SSVL---G-CSN---LQSLVDQRFKA---NRLDLVLVEVLERGGC	1255
SHRIMP	-----PQVK---G-CAS---VRDFIEKYVG--I---SKLSEIVD--ILEGGGE	1211
MUDCRAB	-----PHSK---D-YTS---VHKFIGQOLEKP---ESIKKLV--IIEGGGQ	1209
TARDIGRADE	-----LALK---N-ATS---GGYFFENLARSK---GPGWPSK--AFPCGGF	1249
HYDRA	-----LLQE---G-VEE---YMKNAIADR---DGDLDLR--YFEGGGI	1177
SALPINGOEA	-----PLDTPD--E-TGKPYATAHAWVAA---F---GAPALVA--LVEQGS	1227
SPIDER	-----PFSP---G-CSQ---NLSSFIIITYENC---GKNIIED--VFEAILQ	1228
LIMULUS	-----PCLP---G-THN---TQEYFQQLKMK---GQPFIN--SFENGLK	1229
SCORPION	-----PCLS---G-FNG---CKDFSHLLETK---GKFFLN--CFSEMS	1227
ROTIFFER	-----PNIS---G-VKD---IKYFWIRLVNE---SEMFLA--RFBOSTL	1241
CIONA	-----KLLPT--E-ERS---ATSWVKRKLTKY---GAGNLVK--RFEWGLV	1224
OCTOPIUS	-----PQIQ---G-IKQ---SEEFQIFYEKE---GHNYFIE--RFEGGGE	1198
CAPITELLA	-----PCVH---E-ING---ARELFSVLISQ---GNSEYFIQ--RFEFGMY	1223
LIMPET	-----THVQ---G-N-----YFVSFDLIDIVDKSTI--IKK--VFEGGGT	1213
SCALLOP	-----PLIQ---G-IKS---TQMYFQAFKSE---KQKYFIT--RFEGGGH	1245
LINGULA	-----PCVP---E-FQS---VQGFQKFLKMS---GGQYFME--RFEAYRL	1234
OYSTER	-----PCIT---G-IKS---TKDYFTFYKSE---KASYFIN--RFEKQQQ	1223
SNAIL	-----PLIP---G-ISS---PFDFKAAALDIQ---NASYFVV--RFEGGGQ	1227
SPONGE	-----PPSS---N-VVN---IRMWIRKTIESE---GGNYFVT--RFEHSHG	1234
PRIAPULA	-----MHQSKL--P-VKS---AAEFFKLLLDLH---RAEYFIE--RFEAGGI	1245
DANTO	-----PLLP---G-NSS---PAMWLDQQLKQR---GPGFLIS--CLEGGG	1242
ESHARK	-----PLLP---G-NKT---PSCWLADVLKER---GVSFLIN--KFEAGS	1233
BHARK	-----PLLP---G-ART---ASLWLEILKRN---GVSFLIN--KFEAGS	1235
XENOPUS	-----PLLP---G-NKP---LTAWLDDQVEKE---GIIFLIN--RFEAGH	1251
STERLET	-----PLLP---D-NKS---PASWLDLILKQ---GVAFLIS--RFEAGR	1249
GAR	-----PLLP---G-GKN---PAVWLEDILKDE---GEGFLIR--RFEAGR	1236
HUMAN	-----PLLP---G-NRS---PNLWLDVLKKE---GVSFLIN--TFEGGGC	1229
PLATYPUS	-----PLLP---G-NKS---PASWLDLILKKE---GVSFLIS--RFEAGT	1231
TASDEVIL	-----PLLP---G-NRS---PSCWLDLILKKE---DISFLIN--RFEAGN	1234
COELACANTH	-----PLLP---G-KKS---PAAWLDEVLLKQ---GVSFLIQ--KFEGGGN	1237
CAECILIAN	-----PLLP---G-NKS---PSSWLDLILKKE---GISFLIS--RFEGGGS	1239
CANARY	-----PLLP---G-NKS---PSSWLDLILKKE---GVSFLIN--KFEGGGT	1228
OSTRICH	-----PLLP---G-NKS---PSSWLDLILKKE---GVSFLIN--KFEGGGR	1198
GECKO	-----PLLP---G-SKS---PSLWLDLILKQ---EISFLIK--KFEGGGD	1237
TURTLE	-----PLLP---G-NQS---PSLWLDLILKQ---GISFLIN--KFEGGGN	1237
ALLIGATOR	-----PLLP---G-NKS---PSSWLDLILKQ---DSSFLIN--KFEGGGN	1197
APLYSIA	-----PLLQ---G-VKS---QKTFFSIIHKSE---GASYFLK--RFEGGGQ	1234
TRICHOPLAX	-----PQLS---G-VST---IQDWKTIIGSS---SVTFIT--RFEGGGS	1214
SOFTCORAL	-----PLLP---E-CSS---VQIWMKKTVESD---GEDYFIL--RFECCFA	1227
STONYCORAL	-----PLLP---G-VNS---AADMKKTHEDH---PSSFVH--RFEGGGG	1245
SEA ANEMONE	-----PLLH---G-IGS---AAIWMKNTHEKH---DSFFVR--RFEGGGG	1232
SEACUKE	-----SVLP---G-SNS---ANVWMKNTLKEK---GASYFIN--RFEGGGG	1244
LANCELET	-----PLLP---R-KPS---PQAWMKERLKEK---GPDYFV--RFEGGGG	1252
STARFISH	-----PLLP---G-HNT---PQIWMKNTLKEK---GPDYFV--RFEGGGV	1252
SEA_URCHIN	-----SLLP---G-RNT---PATWMMQNTARER---GAEYFVG--RFEGGGH	1256

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	NLPTLDE-IIQF-D-----DYLIT-TYNIHQIIRYP-----	1236
TETRAHYMENA	NFFSVQEEELQF-E-----DIIDSFCTNIENFNLSLFKIQE	1292
STYLNCHIA	K-----IASF-S-----DIKSK-LVDINVMGNLYSFLA	1288
APHANOMYCESa	TLGNASLADAV-LL-DPVVAKRT--HDDEAVEG----PHRLFVAIAEVES-GSREA	1219
APHANOMYCESe	TLGNSSLIDENV-LL-DPSAMKRLSSTNADVQN----SHRVFVAAKHFAN----VD	1191
PYTHIUM	LGDDAKTIIFST-S--GGSTALKRK-LDELEPTGSKSSEHTTISWAKRFLEIHGAIVS	1278
PLASMOPARA	LGDKTRGIFEIC-GSHSKKSVKRR-HT-AEVSDTENNCCQOTLSWALLTINCDSGRNY	1275
BREMIA	LGEKTQVFLKFP--IKSRRENLRKK-HA-AEVNSTSFDTCEETLSWALSTLSYDGPWED	1261
AEDES	SLLRNAE--EF-----LSASNLFAPVAVLESVS--NA	1282
MIDGE	DLVNSEQKNEL-----FKHSVVLKIIFYLRGFI--NK	1248
BOMBUS	DLNMQCLFDNS-N-----SQ--KDEIFNCARNFHVMMRIKI	1200
ANT	KLLFTEMLFDV-D-----KQLIFFCTIRSAQFWOIT	1218
WHIPWORM	KLISLEKWAHC--L-----HG--NEN----LGLALSTPFRFAC	1266
TRICHINELLA	NRISMEAWNDY--L-----LN--EDP----RVKSL-----FPC	1276
BEEBLE	KLSSL-----SECTTSIRYFLENVS--TI	1220
BARNACLE	GALPTDRPISS-----DSVLLDNIRFLMAEAF--K--	1223
THRIP	NI--PPVTLFDL-----NSSKITPALMHFLESIV--GT	1217
FLEA	TLFTPTLFS-----LEESKILVTIQYFINNIV--NI	1205
WHITEFLY	IIDPGLLLKA-----DSRFLMALKYFINVNG--AT	1239
TICK	RLLEPKNLFEVP-K-----KP--SGLFGMVDFLEHLA--VC	1250
TERMITE	ELVKPSVLWGTG-G-----LDNTSETRIFAFAVYIQHVC--HR	1266
DAPHNIA	GVIDTDKCDSD-----VDFSDQFEIFAKSVERRLD	1185
OSTREOCOCCUS	RHAGGEF-FPAT-----RTMHFRAAGLEERTAQVNE	1273
STENTOR	GVREW--N-----GELEKKISELEMKKDED	1137
KLEBSORMIDIUM	QLTVAEIVPQG-E-----VEETRPGHPVVCLRRFLESFADETD	1358
CLUMBOSS	QMIGLEEIEPLR-T-----QIFSRIN-----	1218
MOSS	NIISIKELLDPE-R-----DCVIHIAS--SISALQSLKLS--	1301
LIVERWORT	EMITTRRELLGRT-R-----SSF-----VVSSFLHRVFTG--	1313
LIGNANO	GLLDPOQLLGGC-G-----GSRLCQLRSLDFNETDPSLD	1362
COPEPOD	NICSMDELEKT-----NSRIKDLTNLFLKVVYGTÉE	1248
GLOBOSUM	GALTAQASIVLQ-----SDIVTSIVTFLDAAADVET	1212
PALUSTRIS	GIMEASALLDQT-----QSQLLPAFVFINVYADTDV	1265
NEOCALLIMASTIX	KLLESSLFPKSR-----LNCFISSIVYFINMSKKEI	1324
GLOMUS	KFVPPDLITSS-----GIMFRKAINYFLENLVQNDI	1349
LOBOSPOR	PGSAELLLAQLEKG-----AIMNTSTKFLHCLLFPRELKRGDM	1304
SYNCEPHALASTRUM	DMVTVMVVLNQP-----SSVLLDACRYLVIEVSKIVA	1280
FUNCTIVORUM	GFCELL--QEG-R-----DSHSMLLCALHHRWAKTST	1263
HALBUM	GFDDPVAISKDG-----SSRIISNAFVYFSEYALVQD	1390
DPURPUREUM	GFIEPSALVNTG-G-----NGSTLLSTIFNVVHYALVND	1377
PVIOLACEUM	GFLDPMI--G-S-----STSKILTTFPHIFNEFALLET	1357
AMPHIPOD	RLVPSTVLLTHR-D-----SNLLAALQLFLNVVPEPR	1329
SHRIMP	GIVPAAKLNHS-E-----LQLFSATYFINEMALLTV	1288
MUDCRAB	GIVPADKLLCK-E-----SRILLASSYFLQNIATKSL	1285
TARDIGRADE	VYVKADMKNRP-E-----WKVFGDCLSEFDKVVLRV	1330
HYDRA	RYLPAQKIFKNG-S-----TSKLFPAIVYFIDEISLVNC	1254
SALPINGOBECA	RLLTPRALLVDC-E-----MLLWGLAHLFSTFPRRS-	1297
SPIDER	QLMLQMLCEEK-N-----ASLISCIKVFNALIEHLENIVKEPL	1302
LIMULUS	CLLEPSSVFKA-----SIQSKGTKIFASLEFLSHFIS--	1298
SCORPION	SVLKLSDIFND-----AS-NRSEKFPFSEFLKTKCIDFD	1297
ROTIFFER	RLNMKSLFSTK-K-----SCIMSVETFLDKVAFSFL	1321
CIONA	KILSPSIVWGE-A-----NTSCLPKYLYTYMWNISAKSA	1294
OCTOPUS	NLLSPQMLQVA-E-----SNSQIKAVCYFLEYIALSDL	1277
CAPITELLA	RLMSPNQLLAS-N-----NKGTHIFQVHLHMEELAQEDI	1303
LIMPET	DLLTPINIFSGT-G-----SNTSKLFSELEYFLSNISLRSI	1294
SCALLOP	NLLTPVDVFGVG-G-----MNQTNVFKAAFYVDNIALADI	1326
LINGULA	NLLRPEDVFTGG-H-----SSCIVLVSLFLSSLALKDI	1312
OYSTER	SLLNPDIDFSGE-G-----RKQSKLLQAMQHFLSQVVMEDM	1300
SNAIL	GLLSPAKMFESS-G-----FKGTRVFPSSLOQVTEMALGDL	1307
SPONGE	QYVSPREIFST-S-----SSNLFKSIDHFLKCIALVGI	1305
PRIAPULA	KLLOPTALFAGG-T-----GKREERTCFAMVSDMRPSGEE--	1323
DANTO	RCLQQRILGTC-E-----KSSFLPAVHFLETLSMQDI	1314
ESHARK	AMVKPSLELGT-Q-----ETGFMKAMFLETTLARHDI	1312
BHARK	HLVKPSKIMGTS-E-----NSSFLKALNFLETTLARHDI	1314
XENOPUS	RFLKANTVGLGN-A-----EKSSFLKAFFLETLSMNI	1331
STERLET	HLVKPHEVLGAK-V-----QSGFLKALFLETTELAVQDI	1328
GAR	HFVKPQILGTQ-E-----KSSFLKALGFLETTLAQDI	1315
HUMAN	RTVGLQVLGTE-A-----QSSLLKAVAFLETESIAMHDI	1306
PLATYPUS	KTVKAHEILGTQ-A-----KSSFLRAISFLETIERIAFHI	1310
TASDEVIL	RAIKAQEILGTQ-A-----KSSFLKAVGFLETIALHDI	1313
COELACANTH	RMINPREIFGTT-S-----VSGFLRAVEFLETTRLATQDI	1316
CAECILIAN	RAIKPNEILSTT-E-----QSSFLRTECFLETQKLEHDI	1318
CANARY	QMIKPDEVILGN-E-----SSFLKAVQFLETITALHDI	1307
OSTRICH	RMIKPHEILGN-E-----RSSFLKAVRFLETITALHDI	1277
GECKO	GMIKPHEIVATN-T-----ESSFMSVVEFLETALKLDV	1216
TURTLE	GMIKPHEILGTQ-K-----RSSFLRAVEFLETITALHDI	1316
ALLIGATOR	RMEKPNVLTGN-----SSFLRAVEFLETITALHDI	1274
APLYSIA	DLMTLSQLPTGK-G-----SEMCMKPSLEFLRSVAFQDI	1316
TRICHOPLAX	KMMSPEQIGDK-A-----QLGSCKIFGSEFLFKLCKLHSL	1292
SOFTCORAL	RLLTPSSIIFQG-----KTTSVLWRTLTYFLEKLSLNGI	1303
STONYCORAL	HLLSPSVVFTSS-E-----DNEMPSVLLVSLKFLSHLAMFGI	1326
SEA ANEMONE	QLLPADLIRS-----KYSSVLTSLSYFLSNLAMLGI	1308
SEACUKE	RLLTPTPSS-----SNLTKSLQFLDDFAQHD	1318
LANCELET	RFLSPSDVLSGS-G-----KKPSQLFALFLETKLALSDI	1333
STARFISH	KLLSPSVVYAT-A-----RRPSVLFQSLQFLSSLSLDDI	1333
SEA_URCHIN	SLLTPAAVFKTI-K-----EGKSVLFTQIDSFMVQAQ-YDL	1333

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----IVKNQKHLMDSEPLFDMIMTLTQDN-----FNPSQNFQNDAGNIDNWLATS	1283
TETRAHYMENA	-----SVLKSDGLLME-----ILLDDAVID-----I	1314
STYLNONCHIA	DHIVIKFVKNERKSLD-----KLLICKEDKEILTKSRMVLITQPLR-----YL-DQL	1334
APHANOMYCEs	-----PP	1221
APHANOMYCEse	-----EP	1193
PYTHIUM	-----KTTTIER	1285
PLASMOPARA	-----RSKRSRW	1282
BREMIA	-----SSKRSD	1268
AEDES	SM-----FELMT-----VIRPSIVEDSYASIEF-----R-VCTDK	1311
MIDGE	DI-----IDIVE-----LANESHINTSQMNR-----R-MYNRN	1277
BOMBUS	EN-----K-----EDN-----LILLSKE	1213
ANT	ES-----S-AEPTA-----TTIKSR	1233
WHIPWORM	VA-----LSWPS-----S-----DINPEP-----T-----DNR	1284
TRICHINELLA	SL-----DLVNS-----I-----VIGRHP-----PNLSKAQ	1297
BEEBLE	TL-----DEAPA-----IIEP-----KMW-----M-----FTTPE	1240
BARNACLE	-----PS-----F-----E-----DSAEAGR-----WA-----	1236
THRIP	PI-----NQ-PS-----L-----WRPKA	1229
FLEA	DP-----ADLPA-----FLDA-----SVGMMIS-----IKD-----	1226
WHITEFLY	SC-----QHFIE-----ILYS-----DWSAIEP-----QLD-----	1260
TICK	ES-----PQ-----E-----LLRD-----VESEP-----LTSSK	1269
TERMITE	DA-----SSVTC-----LLST-----DTKDVLE-----ITPWE	1289
DAPHNIA	-----QELPTA	1191
OSTREOCOCCUS	-----ISRE	1277
STENTOR	-----I	1138
KLEBSORMIIDIUM	-----DSAL-----EAQL-----RSLTPSE	1373
CLUBMOSS	-----OP-----VEELPAR	1227
MOSS	-----QDS-----IHQP-----LDLTPGE	1315
LIVERWORT	-----HDS-----NSEW-----SSVTPGE	1327
LIGNANO	-----PGRLLASASVS-----AS-----SAY-----SNSISEI	1385
COPEPOD	-----IEPEG-----MDESGAE-----GK-----DPLSPGE	1269
GLOBOSUM	-----L-----NTAF-KS	1219
PALUSTRIS	-----D-----GTVPAA	1273
NEOCALLIMASTIX	RM-----DDNNL-----IFYSVN-----E	1338
GLOMUS	EY-----LTPDAMEIDDGEY-----FIKNVG-----SE-----NILTPAQ	1380
LOBOSPOR	-----V-----TTLTPSE	1312
SYNCEPHALASTRUM	-----S-----NDFGAFD	1288
FUNCTIVORUM	-----DD-----AVF-----ARSTPSE	1275
HALBUM	-----SH-----PAM-----ASLTPRE	1402
DPURPUREUM	-----NKSYE-----QML-----SSMTPKE	1392
PVIOLACEUM	-----DK-----L-----SLF-----SSMTPSE	1370
AMPHIPOD	-----H-----VL	1332
SHRIMP	-----SEYMK-----NHDAF-----QN-----AVATPYE	1307
MUDCRAB	-----SQYVK-----DNIRVSE-----TG-----AIGSPLE	1306
TARDIGRADE	-----TDPAS-----LLA	1338
HYDRA	-----KNMLM-----KF-----M-----QDILPSE	1269
SALPINGOECA	-----E-----LK-----RHDTPAE	1307
SPIDER	-----T-----AL-----ISKHYIE-----ES-----DVFPGE	1321
LIMULUS	-----VEIIA-----AM-----DLLSPKE	1312
SCORPION	-----QRVQA-----FPTHEVS-----KK-----QIFSPKE	1318
ROTLFER	-----QNFLS-----HNYTE-----AH-----ILFSPNE	1340
CIONA	-----EQLTS-----PSA-----DS-----KGLTPKE	1311
OCTOPUS	-----KTLTK-----NA-----DY-----LPFTPKE	1293
CAPITELLA	-----SAAVK-----LFPKVAD-----GS-----SIFTPRE	1324
LIMPET	-----DEVSK-----LFKES-----S-----V-----EYFTPPE	1313
SCALLOP	-----ETVAN-----LFPNOPE-----T-----TFFTPRE	1346
LINGULA	-----EAAAD-----LFTKGLD-----R-----KIFTPWE	1332
OYSTER	-----DEVGK-----MFRHEPL-----T-----DVYTPKE	1320
SNAIL	-----SVAAK-----QFORKAE-----A-----VFFTPKE	1327
SPONGE	-----EGVNV-----SPEVA-----MATSIHE	1322
PRIAPULA	-----R-----RRR-----RR-----WADR-----RHVHPGE	1340
DANTO	-----QAARA-----CFRLGNA-----GQ-----SHFSPRE	1335
ESHARK	-----TAAEE-----CFTLGVK-----G-----VLFSPRE	1332
BSHARK	-----TAAEE-----SPAYGIK-----G-----ILFSPRE	1334
XENOPUS	-----KAAEQ-----CMG-----SK-----S-----SVFSPHE	1349
STERLET	-----SAAEL-----CFVSGPK-----G-----ALFSPKE	1348
GAR	-----SAAER-----CFSSGSE-----G-----SLFSPRE	1335
HUMAN	-----IAAEK-----CFGTGAA-----G-----NRTSPQE	1326
PLATYPUS	-----TAAEQ-----CFGTGSK-----G-----SMFSPQE	1330
TASDEVIL	-----RAAEK-----CFGTGIK-----G-----NVFSPQE	1333
COELACANTH	-----TAAEQ-----CFTAGSK-----D-----TMFSPRE	1336
CAECILIAN	-----TAAEQ-----CFRTGPS-----G-----NIASPOE	1338
CANARY	-----HAAEQ-----CFDSSK-----G-----SMFSPQE	1327
OSTRICH	-----QAAEQ-----CFDCGLK-----G-----SVFSPQE	1297
GECKO	-----SGAEQ-----CFWTASK-----G-----NLFSPQE	1336
TURTLE	-----SAAER-----CFDTGSK-----G-----NMFSPQE	1336
ALLIGATOR	-----HAAEQ-----CFYTKSK-----D-----NVFSPQE	1294
APLYSIA	-----EGVSK-----LFPSS-----KV-----TVFTPWE	1335
TRICHOPLAX	-----DETVK-----LLYSK-----STL-----QLFTPPE	1312
SOFTCORAL	-----EKAFE-----CFPTTSDG-----VNT-----HAFSPSE	1326
STONYCORAL	-----TEATS-----CFRTGPS-----RGMG-----DIFTPKE	1349
SEA ANEMONE	-----QAAIK-----CFPKT-----THIT-----DVATPKE	1329
SEACUKE	-----EHVAL-----SL-----AQHR-----GIFTPWE	1336
LANCELET	-----DAAAR-----CFESHG-----AA-----TLFTPPE	1353
STARFISH	-----TGAAR-----GIEYGGSK-----SAFH-----QVFTPPE	1358
SEA_URCHIN	-----FAFAK-----GC-----GSME-----TAFTPPE	1351

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	PEKLVBEQLITTFERYVKF-----VRTF---HIDVE	1310
TETRAHYMENA	QENQYQAVINLFIKICEFMSLLSNDILNFTTFL-----DVLN---NITLE	1356
STYLNCHIA	DEESLLAHADLFQKNCNFNLIH-----F--C-----VQIM---VIPLI	1367
APHANOMYCEsa	SMAR---NRAFGLVCNVALALEHPTV-VPELHRHVM-----NVL--TGTT--D	1262
APHANOMYCEsa	TQAR---NRAFEGVCKLVTLAINSETS-LPLLSKQVD-----Q-S--GLVD--N	1233
PHYTIUM	DEQY---KTRHQLLEAFIQSAEALSNL-LLKNGRSTM-----SSN--VVSEFQL	1328
PLASMOPIARA	TEAY---LSVLVSLCNFVKAIMSHGNI-LLRETLDDL-----NQ-----	1317
BREMIA	IAAY---MSVVISICTYVKSMMENEM-ILCNSIDVD-----NR-----	1303
AEDDES	IIKFNLLKCTIIVRIVDLLSLLPLRCC-R-S-----VP--DAFWDSA	1350
MIDGE	VDNI SVTRSLILVKIIDLFTTISIEIDEV-S-E-----FL--TKY--QF	1314
BOMBUS	TELODTLQCKAAILNIFDPQILLNFPDGN-FI-----PDPFFNK	1250
ANT	LEQLOVLRVLMTFLNFQVLLDYN-I-L-----PESLWDE	1269
WHIPWORM	SOLMKRRCA-FLSLLDFLTVFVQYNE-NPED-----QP--AAVVEDR	1324
TRICHINELLA	RNRNKRCKRSFVALCKLIAALISQNL-NNYQ-----GF--LKLLYP	1338
BEEBLE	KLHFDKQRSQAVIKILQLPTIC-----E-----TI--TAFY-TS	1271
BARNACLE	--PVRRLCTALVRALAVIEALRAAPR-AV-----TDIW-SL	1270
THRIP	MEQFNYAKCTIIVRMIDFPTAVLDIGQG-SK-----L--SPFWSS-	1266
FLEA	KEKFIKFTYNTFIMILTFVSKILFCDDA-DE-L-----IT--SFSWLN-	1265
WHITTEFLY	SNLYSSVATEVLAQLKFK---LTIISHN-SLKE-----EF--FCEILKE	1297
TICK	LSAFNLAKCSVTIIRLNFNLAWMETSHG-SMAS-----VA--SPFWRSR	1310
TERMITE	AESFDRTKCFVIRLLDMISTVLKSGEA-GC-----L--PHSLNLN	1327
DAPHNIA	EVPLRDTTSESFLAWLSFLEYLTKSQNRKLR-----ALL-ALIL-DDDQGVV	1226
OSTREOCOCCUS	KNAVQNHLYVTRERIPALDDTILKSALRGAEDK-----M-SAV--TMDLFS	1324
STENTOR	TEAL-----RFLKVLKLYVEFPH-----POVQV	1462
KLBSORMIDIUM	RESFHRTRCSTIRMGVLSFVQVKSGLCESTLASVGVKNP---SAQVQVQWTDVVPVETD	1461
CLUMBOSS	CI-FLKENDSAIHLMLAFKDIQMGIGASEPSSVETPSRDD---KEKLAELILPHYD	1282
MOSS	QDELQKRYEATTHLMKFCSQVINAQSGYAEIE-----DLALRTIFMPDQSR	1362
LIVERWORT	RESHRKLVCGAVHLLGYIRQIVDSELGTRETGVF-LPRRVDKGAVDMQLEGLLFPSEP	1386
LIGNANO	RASAVTIRCOLIVRTAALLQLAGKQD-CLKD-----LL--QKGENSN	1426
COPEPOD	RRRLEKKGCTIIRLFTFLTSVLKLEKGRNLLS-----AQA	1305
GLOBOSUM	LDAFNNRNVFVLKVVFEVFNVSFVGTAVLAV-----DK-KHW--SPIFECE	1260
PALUSTRIS	KHQYNQKRSITAKAVDFLLSLQRDGE-----NAKKLE--EARIWSS	1315
NEOCALLIMASTIX	ISKLNMRDYITPKIFNFKVLEIE--NSMDIRK-----TLENLK--EHKVFNS	1382
GLOMUS	KLQWLTRKIQIEHLLIGFNVLFKEDT---PN-----NVESLW--NSNINGK	1422
LOBOSPOR	RQQIMDQMLTARKAISFVSVIVASQSGRSDTK-----FIAQLQ--ASGLLDS	1358
SYNCEPHALASTRUM	RRRLNALYATYRACFLTCLASSNQSDAYA-----M--SAV--TMDLFS	1332
FUNCTIVORUM	MICYHQVNTILLSLGRFSLQMKLSTK-D-N-----QIISQ	1310
HALBUM	IDQFMTLKQCTLEHYVALPSMLLEKYNV-SQVM-----FTGGI	1439
DPURPUREUM	IDLFNRMKQVITNLFGLVILLLEKYNF-QEVI-----EISGQ	1429
PVIOLACEUM	LEHYNRKCSVIMNLFGLFILLMEKHNV-EQVM-----SYGGI	1407
AMPHIPOD	SSSKQVNSCTIIVRLMDFMTVMKDKET-SQSL-----LA--SIFCP	1371
SHRIMP	TEATAKAKCTIIVRLDFVSVVLQEGPK-VASL-----LS--QHSVWSA	1348
MUDCRAB	YEASNKIKCTIIVRLDFVSVVLQEGPK-SVQL-----LN--EYSIFTA	1347
TARDIGRADE	TESLRTIIGGLIRLRLDLMVTHTYGR-DGIA-----VL--PPVVASK	1379
HYDRA	CDTYDRKCTIIVRIIYIISLTLDEE---LWK-----ANTMKDI--GDKMFSN	1312
SALPINGOBECA	AAAYRYLKCTVMVRVLDVVRTVLRVDAS-----AL--PTKLWSG	1344
SPIDER	TLKYNRLKCTVIRLLNFTSVFATDAK-WFHD-----KF--LKVWNS	1362
LIMULUS	KGEFKRVKCTIIVRLNFTVLIQNFSK-ELSS-----CT--PQSLWMS	1353
SCORPION	KDEYLRNCFIIVRLINFTVIENHIL-QLN-----TI--PSTFWSI	1358
ROTIFFER	IDEYNGLKCTVMIRLMDFLETIFANYSK-ESLD-----VI--PMSLWMS	1381
CIONA	ISSFNDLKPVTVMIRIMEFVSALLKYNQ-EAIK-----VV--PKSMWEO	1352
OCTOPIUS	EEVFNRRKCTIIVRISFSLTVLKKCKDAENSS-----VI--PNEVWTP	1335
CAPITELLA	REDYNQKCTIIVRILSFICTMFGNYKT-ESLK-----VI--PTSFWSS	1365
LIMPET	IEDFNRRKCTIIVRITNFLSVLIGKYPK-DAIK-----VI--PGTVWSD	1354
SCALLOP	IDEFNREKCTIIVRILNLFVSVVATSGAKDLNK-----AV--HPEIWSG	1388
LINGULA	VEEYNRKCTIIVHLLDFLCSSTISKSGS-HLEQ-----VV--PSNIWCP	1373
OYSTER	RDEYNRKCTAVRVLNFFCVLVARSPS-SVKK-----LL--PSEILGK	1361
SNAIL	KDDYNKCTIIVRIMNFTVLIRARYPS-EAFK-----VI--PQTLFCD	1368
SPONGE	RGEYQRNKCTIIELLTFIELLTKHTS-ETVS-----FEYV--PDSLWSQ	1365
PRIAPULA	MEKYNRSKCMVIRAMDLSILLMMAS---LQ-----VI--PDSTWSM	1378
DANTO	TEQYNSKCSIIVRMLEFSTMVLRKCPQ-DLWK-----LM--EKDFVNS	1376
ESHARK	REEYNYKCTIIVRIMEFACLILELQO-DWK-----VL--EKDLLNS	1373
BSHARK	REDYNKCTIIVRIMEFVSMVLEDCOQ-DPLK-----ML--EKYLLNS	1375
XENOPUS	IEAYNSKCTIIVRIMEFITMFDICQO-DSLK-----IL--ENSVFNE	1390
STERLET	REDYNSKGTIIVRMEFVSMVLENCQO-EFWK-----LL--EQNLINP	1389
GAR	REDYNSKGTIIVRMEFVSMVLDKCSQ-DLWK-----VL--ERDILHL	1376
HUMAN	GERYNSKCTIIVRIMEFMTLLNTSP--EGWK-----LL--KKDLCNT	1366
PLATYPUS	REEYNSKCTIIVRIMEFATMLLNTYQ--DTWK-----LL--EKDLLNA	1370
TASDEVIL	REEYNSKCTIIVRIMEFSSMLLNTYQ--DVK-----LL--EKDLLNA	1373
COELACANTH	REDYSKCTIIVRILTFVSMVLEKCPQ-DLWK-----VL--EKDLLTP	1377
CAECILIAN	REDYNSKCTIIVRIMEFVSMILENCQO-DFWR-----LL--EKDLLAN	1379
CANARY	RDYNSKCTIIVRILEFVTVILEMCOQ-DFWK-----LL--EKELLNA	1368
OSTRICH	REVYNSKCTIIVRSMFVSMVLESCQO-DFWK-----LL--EKELLNA	1338
GECKO	KEDYNSKCTIIVRIMVFSMILETCOQ-DFWK-----LL--ERELLNK	1377
TURTLE	REEYNSKCTIIVRIMAFVSMILETCOQ-DFWK-----LL--EKELLNA	1377
ALLIGATOR	REEYSKCTIIVRILRFVSMILETCOQ-DFWK-----LL--EKELLNL	1335
APLYSIA	KDEFNRKCTIIVRILNLFSLILARHSQ-EVLKVK---H---SCLKLVV--PASLWCE	1385
TRICHOPLAX	IEEYNMCKCTIIVRILNLFVSMILETCOQ-SIIE-----GI--PROIWSQ	1353
SOFTCORAL	IQEYNRKCTIIVRIIAFITLLQMNK-EYLE-----IV--PSELWTG	1367
STONYCORAL	IDDYFRAKCTIIVRILNFTLILLQDFPQ-ETLK-----TL--PPEFWE	1390
SEA ANEMONE	MDEYNRVKCTIIVRIMNFTVLLQAYPD-QGFK-----IV--PTSLWSD	1370
SEA CUCUR	QERYNSKCTIIVRIMDFLTVLLGNFSP-EAMK-----VL--PSSFWVG	1377
LANCELET	TEDYNSKCTIIVRIMDFLTVLLGAFPP-DAYK-----VV--PDVWKS	1394
STARFISH	SEYNYQKCTIIVRILDFLTVLLENYAS-DAVK-----VI--PKSIWQD	1399
SEA URCHIN	EEDYNRKCTIIVRILFYMGAMLSHTK-EALE-----VI--PSKLTWG	1392

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	QYYN-LS---IGI I ---IRPSYFLKGIQLDLYFGQVDSVVNE-----AQ---	1347
TETRAHYMENA	NKYS-IF---LQML---LKPNNHILRGMNIDIFLTKSELYPEK-----	1391
STYLNCHIA	HQ-----LQVL---VE I QELERQLR---NQSELLLRK-----LVAIK	1398
APHANOMYCESa	RWWD-LV---VLA A ---VDPKAA L FEL---S-----T-----	1285
APHANOMYCESe	KFLE-FV---VQAR---IEPRV L KEF---S-----	1255
PYTHIUM	EGRD-DVIADLLSVIGLL V G-EGSGSL---KLL---DK-----	1360
PLASMOPARA	SLRD-SVVGKLV E VI---FHRADL L HNA---SSF---RA-----	1347
BREMIA	SFRR-AVTERILQ A L---LR T SM L HD T ---SLV---GK-----	1333
AEDDES	AVSQ-FV---VDLV---YQ O KL E DFDK---SECRETMEQ-----	1379
MIDGE	EIFD-IT---KQ L I---FL O R L E S YK---TRN-SLIK-----	1342
BOMBUS	DFFE-LI---AK C I---M C Q V I F DLK---NLE-ITEE-----	1278
ANT	PLSA-LT---M K S L ---M N PR V I F DK---NIQ-MDK-----	1297
WHIPWORM	NIWC-TV---IK G L---F E PE S M F SDH---AVE-TEDL-----	1352
TRICHINELLA	NTWN-AP---LK V A---C D PK S L E FR L Y---SKQ-FF E C-----	1366
BEEBLE	HLWN-LL---V N F V ---F N R O S L E F EC F ---QPQ-DDDN-----	1299
BARNACLE	PVCD-TV---A A AV---L A PA E L E FD V S---E A E-V V RE-----	1298
THRIP	NFWK-LL---I N C C ---V W PS N L E FD S T---SKN-VEEN-----	1294
FLEA	RLSN-VV---V N C L ---F C Q D L E FN V E---NNY-IG Q N-----	1293
WHITEFLY	PLWK-LI---V L C T ---L R P S T V ARG V ---C S E-T S L K -----	1325
TICK	AFWR-CT---V V C V ---L S P S D A L F DL T ---D L E-V A N Q -----	1338
TERMITE	QLWQ-LI---V A C V ---L H P S L E FD L Y---N T E-V T D G -----	1355
DAPHNIA	-----T L ---I R T C ---L L P S R L E F SD A ---S G S-Q O Q F -----	1250
OSTREOCOCCLUS	NACK-VM---S A A T ---F F P O N L E Q E---A S K-K S I T -----	1352
STENTOR	D-----F L ---L K F L ---L T P K I E FP E G---A S -Q E F I -----	1197
KLEBSORMIDIUM	SFHR-LM---C L L L ---L R R R L E FP V S---D L K-Q B F I -----	1459
CLUBMOSS	KLQH-LL---C L L L ---F K P S E M E T TP P ---E S S-G A E E -----	1310
MOSS	YFQQ-LL---C L V L ---L K P R O L E L V I S---E L Q-R A Q D -----	1390
LIVERWORT	DFPE-LM---C L A L ---L R P R O L E V A T ---D S H-H A E E -----	1414
LIGNANO	GLWT-AL---A R A T ---L R P O L L E F DA Q ---D P S-L M A K -----	1454
COPEPOD	EFAV-LL---T O T I ---M E PE K L E FN L K---S N Q-DE D Q-----	1333
GLOBOSUM	NFYR-ML---A L T M ---F A PE K L E FD V G---L D A-T K D E -----	1288
PALUSTRIS	KFPH-II---A T C V ---F R P H E L E F A I E---S Q E-V K R N -----	1343
NEOCALLIMASTIX	DFID-LL---N C S L ---Y N I R L L E N D L E---E K D-T O I S -----	1410
GLOMUS	QFYK-LL---G N C T ---L R P N I E L D O---L P D-N I V K -----	1449
LOBOSPOR	RFFA-VL---A A C T ---F N P D S I E S -D O ---L L K-G S E E -----	1385
SYNCEPHALASTRUM	DLSR-LL---A H I V ---L L PE Q L E V V Q O ---A E Q-G A L S -----	1360
FUNCTIVORUM	HYLT-LV---L T S I ---L S P H M L E F T S ---D I N-Q I D-R M R S T A V Q V I V D I H R C N	1354
HALBUM	QLLR-VV---G V S L ---L T R A V V E R T I ---D N N-M N A S N S G-----	1470
DUPURPUREUM	PFIQ-LL---T K S L ---M D P O S I E F T N Y---I D E-K V L-----E L Q S S A	1462
PVIOLACEUM	SFIH-LL---V L S M ---M D P K L E FD T I---S P D-N M I G Q E S K S S ---E D V S D Q S	1449
AMPHIPOD	NFRK-IF---V T A V ---L E P A S V E F D L R---D T E-V N E K -----E D V S D Q S	1399
SHRIMP	TMFS-LL---T C C T ---L D P A S V E F D I K---D T E-V S K H -----	1376
MUDCRAB	EMYG-LI---L Q C V ---L N P S S V E F D V K---D T E-V T K H -----	1375
TARDIGRADE	SFAD-II---V R M V ---L D P K A V E F D L H---E V ---D R -----	1404
HYDRA	NFLK-VI---V Y C M ---V Y P Q C L E F Q V S---D L E-V L E K -----	1340
SALPINGOEBEA	ECLD-FI---C K A V ---L M P I M L E F D P S---D P E-I E E K -----	1372
SPIDER	NLWE-LI---L L L V ---V N P T S L E F E M T---D P E-I A T K -----	1390
LIMULUS	SLWK-CI---S L C V ---L D P T S I E F N M T---D L E-I M T O -----	1381
SCORPION	NFWN-CI---Y S S V ---L N E K L E FP D M T ---D T Y-I F N Q -----	1386
ROTIFFER	NFEG-LV---I M S L ---L M P T S L E F S L K---N L E-I F S N -----	1409
CIONA	EYYIGLL---T Y A V ---V S P V L E P T S T ---K E T-D L E N -----	1381
OCTOPUS	HLWR-LI---C E C V ---L Q P E Y V E F N L T---D L E-V V N K -----	1363
CAPITELLA	NLWD-TL---L L A V ---L Q P T O L E F N M G---Q V E-V M N H -----	1393
LIMPET	TLWE-LL---I K C V ---V O P O S V E F N M G---D V E-V M N N -----	1382
SCALLOP	ALWE-MV---C M C V ---V E P G S V E F N L G---E V E-V M K N -----	1416
LINGULA	DLWI-LI---C D C V ---L N P S A L E F N M G---D V E-V M M K -----	1401
OYSTER	DLWN-LI---S M C V ---L Q P S A V E F N L G---D V E-I I K N -----	1389
SNAIL	DLWR-LC---I R C V ---V O P S S V E F N M G---D I E-I I T K -----	1396
SPONGE	ELYT-IV---M D S L ---F Y S S L V E T A P D---D P S-T A K R -----	1393
PRIAPULA	ELWD-VV---L L S V ---L D P T R V E F N M A---D I E-V V E K -----	1406
DANTIO	SLFT-LV---V L A V ---C E P S S I E F N M A---D L E-V M T H -----	1404
ESHARK	DLFE-LI---A M V V ---I D P T S I E F N M A---D V Q-V M K N -----	1401
BSHARK	TLFE-LV---A T V V ---I D P S I E F N M A ---D V Q-V M K G -----	1403
XENOPUS	PMWE-LI---A I T V ---C D P S S I E F N T A---D V E-V I N N -----	1418
STERLET	TFPE-LI---T T T V ---C D P S S I E F N M A---D V E-V M K N -----	1417
GAR	TFPE-LI---A T T V ---C E P S S I E F N M A---D M E-V M T N -----	1404
HUMAN	HLMR-VL---V Q T L ---C E P A S I E F N I G---D V Q-V M A H -----	1394
PLATYPUS	TFME-LV---V E I V ---C D P S S I E F N V A---D V Q-V M S N -----	1398
TASDEVIL	YFME-LL---V K T L ---C D P S S I E F N I A---D V Q-V M N N -----	1401
COELACANTH	ALLE-LT---V R T V ---C E P A S I E F N T A---D V Q-V M K N -----	1405
CAECILIAN	NLVE-LT---V L T V ---C D P S S I E F N V A---D V Q-V M K N -----	1407
CANARY	SFIE-LV---V M T V ---C D P S H V E F N T A---D V Q-V M K N -----	1396
OSTRICH	SFIE-LL---V M T V ---C D P S H V E F N T A---D V Q-V M K N -----	1366
GECKO	NLIE-LT---V R T V ---C D P S I E F N T A ---D V Q-V M E K -----	1405
TURTLE	NLIE-LL---V R I V ---C D P A N I E F N T A---D V Q-V M K N -----	1405
ALLIGATOR	NLIE-LL---V V T V ---C D P S A V E F N T A---D V Q-V M K N -----	1363
APLYSIA	DLWR-LL---C D C V ---L R P A S V E F N L A---D T E-I M L N -----	1413
TRICHOPLAX	NLFE-MI---F L C I ---L T P H O L E F N V G---D I E-V L E K -----	1381
SOFTCORAL	KFFE-AL---C T S V ---L E P O S L E F N V A---D L E-V L E K -----	1395
STONYCORAL	DLFE-VV---L S C V ---L E P G V V E F N M G---D V E-V V E K -----	1418
SEA ANEMONE	DLFT-VV---F S C A ---L E P A L I E F N V G---D V E-V I E K -----	1398
SEACUKE	SFSN-LL---C S C F ---L N P V S V E F N M A---D V E-V M N N -----	1405
LANCELET	PLYD-MV---V T A A ---L E P T A L E F N M G---D V E-I M E K -----	1422
STARFISH	SLFD-LV---V T C L ---L Q P T V V E F N M A---D V E-I M N A -----	1427
SEA URCHIN	LFAB-IL---C G C V ---L K P A S L E F N M A---D T V-I M N A -----	1420

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----RLL-----QGTIKF-T---EF-ROVL-N	1364
TETRAHYMENA	-----ITPVIKALQEIT-----QEGVDFPQ---DVLKAL-E	1419
STYLONCCHIA	NLDLAKI IKK-----D-IVPSMRCIN-LN-----HMTVDNVQ---NYHPK---	1433
APHANOMYCEsa	-----P-----EAVDSWRMCKASLEH-Q---LPFRVU-A	1311
APHANOMYCEse	-----DTQVMNLCQSLRRON-----LLFRNV-L	1280
PYTHIUM	-----FKSFCADVAERSSSLATSLRKRGSIT---SKLLKTI-Q	1395
PLASMOPARA	-----IEEPCSYVTMHSPQWAHQMKMIDRML---IKLHQSL-A	1382
BREMIA	-----IEDFCSYLTVHSSDWAHQFKTVDLIL---LNLKQCL-A	1368
AEDDES	-----VPKR-VMQLLDKIEGFE-----NLRFK---ETVYQKL-S	1408
MIDGE	-----LPER-I IKF I S S I N D H A-----PNEFK---ESLIEVL-R	1371
BOMBUS	-----LFVI-MGNLLQSMHKN-----NISLL---HLLKCEL-L	1307
ANT	-----LPHV-LETLLNSMRKY-----SYALP---DFFPKCL-V	1326
WHIPWORM	-----YSAK-IPALFGALKAN-----HHLC---ASISPIF-V	1379
TRICHINELLA	-----ISQD-VRLFLALKNN-----TFLV---QQVSTSM-K	1393
BEEBLE	-----E-SV-LKGFPLNSLP-----QSQV---LQV---G	1319
BARNACLE	-----LPAA-LDRLLRSVARYA-----D-----AETRRL-T	1323
THRIP	-----LSIT-VQFRLSNLTHA-----PASAV---NDLKCIL-K	1323
FLA	-----YLIK-LNEFIENLR-----QYKN---DTYYHQIEG	1319
WHITEFLY	-----FSEV-VAELLRLD-----KYLTL---QKLAQEL-H	1350
TICK	-----LPNE-MLRFLNCVSRTF-----PKLLA---DDFVGAH-A	1367
TERMITE	-----LPKN-LIQLLGLVQETL-----PSSQL---EELNSEL-G	1384
DAPHNIA	-----YAC-LETILPFLAPDK-----EVIES---	1270
OSTREOCOCCUS	-----RA-AIQLLKTISVDN-----GSSKAKRLYEAVANL-Q	1383
STENTOR	-----VLYDKLSAKVINFLIQG-----	1205
KLEBSORMIDIUM	-----LAKA-SMMLRELAEA-----SSGFK---GCVGIAL-R	1487
CLUBBOSS	-----LRML-VSSVWLSLTRI-----SSGFK---DGLVQVL-R	1338
MOSS	-----LAKL-ASKVLRPTQL-----SSNLK---SEMVELL-R	1418
LIVERWORT	-----LAKL-SLGVIQRLSVV-----SSDFK---EGLTKRL-M	1442
LIGNANO	-----LLDC-LSTAWHAVARNL-----APVGSYR---SSIVSAI-A	1486
COPEPOD	-----FVSC-YIELLRAVRSW-----PEYF---SKLENFF-T	1361
GLOBOSUM	-----VSSR-LVEVITLLNRCL---EQPFKML-----MNTF-A	1317
PALUSTRIS	-----LPRR-MESVLRSMKTNL---PKMWQVM-----VQSL-A	1372
NEOCALLIMASTIX	-----FYNT-LQKLLNLLKNNE---LFIDYKVL---I---SSLA-E-Q	1441
GLOMUS	-----OKLIITQ-VETL-----LKLFKKLSINNV---TQLAQDL-A	1479
LOBOSPOR	-----L-TIL-RDEL-K---VA-----LRVISKLPMSIT---RSCGEML-M	1416
SYNCEPHALASTRUM	-----T---WMT-SEKVLHVQFLFL---HAMVGKGPCKFL---RTFAKSV-N	1396
FUNCTIVORUM	-----NSDVLELLKRSLE-----EVLIS-----QPKYD---IFAWCSM-K	1284
HALBUM	-----NNKQVNEPLPLNLI-VDRVCO-LIVNQ-----GDKYR---DTLIGYL-G	1507
DPURPUREUM	-----REEIRNLMRSRFFKPPPLIEI-IDHIFSLPIAVR-----PKYQ---DFFKLSL-Y	1506
PVIOLACEUM	-----KQEISNLLGRQFKPPPLSEI-TARI IKI I L I E N G-----GAKYK---DTIYQVV-R	1494
AMPHIPOD	-----LLPR-LVDTLQTFORYL-----SQEQK---LVLKRSI-D	1428
SHRIMP	-----LPSR-LEEILGILARRG-----PSEVI---GEYSDDL-E	1405
MUDCRAB	-----LPSR-MEEVLKVMQKV-----PNVVS---AAFIQTL-E	1404
TARDIGRADE	-----LPRQ-MSEFLKATTKV-----DALWT---VMIRQAV-T	1433
HYDRA	-----LPPE-MYTLSEKMRKFA-----PDHFL---NSFYNVL-S	1369
SALPINGOBECA	-----LPKK-TGVVLASLCLS-----GEPR---TNLVAAM-R	1399
SPIDER	-----LPME-VSIVVSKLSK-----K---SEFHAF-C-L	1413
LIMULUS	-----LPHE-TTHLLKAFYKL-----PSPVL---EDFAHSL-E	1409
SCORPION	-----FPKE-TRTLKVFYBYM-----PKPLY---NMFEBEL-Y	1415
ROTIFFER	-----LSPK-IRQFYKLVIQML-----PTDKQ---NKFROQC-Q	1438
CIONA	-----LQAL-NTSALQAALTHL-----PQNK---NLLVASTI-A	1410
OCTOPUS	-----LPDE-LQNLNLPKLL-----PAEFK---QMQRESI-K	1392
CAPITELLA	-----LPEQ-TLGTLIQILMRSL-----PRNLA---QELIESV-S	1422
LIMPET	-----LPSE-VPTKLMFVGITN-----	1398
SCALLOP	-----LPRE-MEQVMVMKSKL-----PTKLF---DNMKHQF-T	1445
LINGULA	-----LPEQ-MEQVLRIFSRYL-----PPKAL---DMFRRTL-K	1430
OYSTER	-----LPTE-MEQLLKVLNAKL-----QPDVL---AAMCKEF-G	1418
SNAIL	-----LPHE-MQVLRVLSRQL-----PLPER---KELVKIL-E	1425
SPONGE	-----ISEA-AVSCLTAMCTSL-----PIDVK---QNLIAIY-A	1422
PRIAPULA	-----LPEQ-TERLLIALSWKL-----PNAPK---KELHSRV-A	1435
DANTO	-----LPEV-CPPLKALASA-----PYR---TQLESCI-R	1430
ESHARK	-----LPHV-CVKLLANVMKS-----PFK---ETLVDVSV-R	1427
BHARK	-----LPDI-CVRLMKALRS-----PYQ---ESLECSM-K	1429
XENOPUS	-----LPNI-CIKLMKALGNT-----SYR---SSEVSL-K	1444
STERLET	-----LPDI-CVRLKALAKS-----PYK---GQLEISM-K	1443
GAR	-----LPEV-CVHILKALKS-----PYK---TQLEQSI-R	1430
HUMAN	-----LPDV-CVNLMKALKMS-----PYK---DILETHL-R	1420
PLATYPUS	-----LPDV-CVSVKALKKS-----PYK---DALEGNI-K	1424
TASDEVIL	-----LPHV-CVNLLKALKKS-----PYK---ESLEINI-K	1427
COELACANTH	-----LPEI-CVRLKALKMS-----PYK---DTLEASI-R	1431
CAECILIAN	-----LPDV-CIKLLKGLMKS-----PFK---NDLEFSI-K	1433
CANARY	-----LPDI-SVRLMKALKMS-----PYQ---ESLKLCL-K	1422
OSTRICH	-----LPDI-SVRLMKALKMS-----PYK---ESLKLCL-K	1392
GECKO	-----LPDI-CVRLKALKMS-----PYK---ESLVTSM-K	1431
TURTLE	-----LPDI-SVRLKALKMS-----PYK---ESLEISI-K	1431
ALLIGATOR	-----LPDN-TVRLMKALAKT-----PYK---SSELESI-K	1389
APLYSIA	-----LPKE-MSQVLAVVHKKL-----PAQLL---KQFKVTL-R	1442
TRICHOPLAX	-----LPQQ-MKDVCGLFOMKL-----PKDKR---ELMIITL-K	1410
SOFTCORAL	-----LPEQ-TFELCKSLASKL-----PKQFL---IHLTTTL-M	1424
STONYCORAL	-----LPEQ-TGVLCKLLVQRL-----SGECL---ERLKGTL-E	1447
SEA ANEMONE	-----LPEQ-VSMTEAAWHIS-----	1413
SEACUKE	-----LPKT-TSOLLELMAANL-----PPKCC---EEFKTSV-A	1434
LANCELET	-----LPQE-TRQLLLMCRSL-----PSQQG---ALLSQV-A	1451
STARFISH	-----LPKT-TRKLLRLMSTHL-----PANLR---NNLSKAV-T	1456
SEA_URCHIN	-----LPQT-TNRVLDLTYTKL-----PTEQL---KKLETVI-H	1449

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	EIPDN--QPVSAQT--I-----TNKDLIKDINELKPFLLKGLKWSNQ--CSD--DQD	1409
TETRAHYMENA	DIFKG--NKPQFEE--I-----ISDEQKLKENEKIFLEGIKLFK--CSQ--SSR	1464
STYLNCHIA	-----M-----MLMSM--CLG--YLK	1444
APHANOMYCEsa	KHLES----STYDR--T-----L--LFNMESDLAQRCLMCTYKQLD--QIK--YWD	1349
APHANOMYCEse	QVLSN----SPYRR--E-----N--LFDMSNLVQWICATYSELH--KIN--FWS	1318
PYTHIUM	DDSAE--SSESPTVR--I-----DRQLLSLRLVNLVVCV--VVE-----	1429
PLASMOPARA	DVSSS--E--S--LSD--H-----SDTITSLTLFGSKVLCAELVK-----	1414
BREMIA	HVDSS--E--T--FDK--Q-----SETISSLSLPGSKVLCAGIAG-----	1400
AEDES	EKLSS--SMEDFSD-----RIE--DLMSSSETIGLEDGNCAKILMVAQR--YTT--FKR	1454
MIDGE	TEVIT--NFNEVWQ-----NCD--KSLNERTISLLESNKLRLGIDMLIQ--LKH-----VLS	1417
BOMBUS	IYVEK--HIYDFVV--LDMIIY--GKK--NFTELKQYVRGLSFLD--RRN--ILN	1350
ANT	MSVRE--HVIKLLN--LCDIV--END--SCDILLQHVNLSLK--KCD--ILD	1368
WHIPWORM	DHLKS--RHP-----WPDVNN--VFSADSCDMSEARQTRGYALLK--RMG--YLP	1422
TRICHIANELLA	EYLTQ--FYP-----WPDVES--VVTCDSHLAIEQQQLLNVMYQMLV--EVG--LQS	1436
BEEBLE	NVLSK--YVTDNFN-----D--EPDKDHWKLRQRHIVRGYIILYQLTSL--LQK	1361
BARNACLE	DSLAR--RAAG--RSVCQALGEA--LSSQ--HDQHVAAQQLRGLRTLQ--SSR--LLS	1368
THRIP	DYLS--VAPDMLN-----RPH--EAIIRDRVLPDKDELVRGLSVLQ-----	1361
FLA	SITIEK--LNECIHEYFNTEVNFN--S----V--SLSVAKNNCLNAISSIC--KH	1362
WHITEFLY	DAFST--EVSVVYENLINKPLMYQ--LL-----HQASNNVEAEGVLVLLQQIQSCR--SKN	1399
TICK	DLVDH--RPECGLDKVLAMPLTNL--DCLRNDLKW--IGLASGYRLLA--ELR--II	1415
TERMITE	KAVSS--MQTDVLS-----NLQ--DSLNRDKVLEQRQLLKGLEILH--KCG--MLS	1428
DAPHNIA	-VLNS--EFFRLEY-----LNLAEATRSLDIIRGLILIV--KSV--YMG	1305
OSTREOCOCCUS	QMVSI--PKFNLE-----VLSSTQGCIAAQRLLVDGYTGLA--SVS--MLR	1424
STENYOR	--V--KAENILK--TWETAFFPERLQTKTGLKGLTALLESP--LL--KTP--VLQ	1249
KLEBSORMIDIUM	SLMEPEGSSFDLGA--VSLDEVLGVSRAAQQAELLSLVRGYQQLF--HAG--ALT	1539
CLUBMOSS	EMLN--TSSEFDIST--LELHQ--ITEG--RLSQMNLVKAYQHLH--TVG--ALV	1382
MOSS	RVIEGDDPAYDLNN--LSPSS--KISGKPKALSLDALSLVKYQQLS--QVK--ILP	1468
LIVERWORT	VL--LADNKFDLGS--IDLSL--DGSNGSGSLGVEDAMSLKGYQQLH--LSG--SLL	1490
LIGNANO	AELELAGQSVTVQR--LLPQSG--LASDPPSVAGAVRLARGVRLR--DCG--LLA	1534
COPEPOD	KVYQE--D--ELFS--PNHLL--VGIIDGNPNMHAVKTYLRLT--KHK--MLT	1402
GLOBOSUM	EYLLS--SD--FDLRK--T-----NIYSRRQTYLQVTLNGLQSLR--KCG--ILE	1358
PALUSTRIS	DVYFN--DQ--IDVAK--V-----NPKDLQRRTLLRVTAGLQQLC--RAD--MPD	1413
NEOCALLIMASTIX	ESIYS--KKFIDTYQ--E-----V--NSLSENSAFLNSIYILN--ASG--ILQ	1479
GLOMUS	EIAFS--DE--VDLLN--I-----ELDKSDPTYDYDITGHYLVLS--SSG--LFP	1519
LOBOSPOR	EAISS--GDLPPLSA--S-----PDVKGQD--PIRFKAVIDGLELVR--ECD--VLE	1458
SYNCEPHALASTRUM	ALIRT--DD--LDLQ--L-----QHGGQALIEMLQTLGGFKVLQ--SVK--LPD	1436
FUNCTIVORUM	EKIFV--EMSN--VI--I-----QMIKLEAETLTVQ-----	1411
HALBUM	E--MIS--SSSCLNLE--I-----GVLITTEGTRDLVSLINGYNTLQ--KQS--ILD	1549
DPURPUREUM	EILLD--KKSFNLLN--I-----NELINLEGTDKLIQLIHSYQIILY--KPK--FLD	1549
PVIOLACEUM	E--YIL--LDQYNLLQ--I-----DKLLAQGSDRIIQLIHCYKNLY--TNG--MLD	1536
AMPHIPOD	SLMSG--DNLRLST--LLPLHSS--AVTYVAPTRHFHFGVAALH--QTE--WLD	1473
SHRIMP	KQLQK--PENDIIK--MLPLSL--ETAHINLRSRHHVIEGIGILE--KSG--WLA	1450
MUDCRAB	KYLGs--PQYDVL--TFTSPLA--EGVNVPLKSHVIEGLQILQ--RSG--WLA	1449
TARDIGRADE	-LLL--KPEYDMVE--L--L--RNSGKLENVHLLVAGFTVLH--EASQTELVK	1476
HYDRA	SVLCE--KQYNLLS--HLPDLC--NTNN--DICDMLCQLASGYKLLH--KCE--LFA	1415
SALPINGOBECA	TTLAS--DECDLLR--MVRD--VLPGRDIPAPLKNVSVGQQLL--AAD--LLD	1444
SPIDER	EYLS--KNGCNLEK--LLPLKLS--DPRCNLSQMTTELLNGYDILL--KNG--FHA	1459
LIMULUS	RHITS--EESSNLMA--MLPLDLR--KKYIDHMLRHLHLLNGYBQLI--NCG--FWP	1455
SCORPION	EYL--ESKNTLN--LPLMLN--DKLKIIEIQEMLLGYBQLI--ENK--LWP	1459
ROTIFFER	QILLD--SRELND--FVLKDIWINSQTIAGYELLS--DFK--IFK	1479
CIONA	ERLAG--IGSLPE--SLPPFP--STASHNNAIHLITGHQTLN--SCE--ILL	1454
OCTOPOUS	NQLVN--QRDLIT--VLPJHLK--SPNTNYFKLQQLITGYRIILN--KVK--LLG	1436
CAPITELLA	RHLNM--SSCDLSS--KLPJPLL--EPNODYQLRLVLSGFBOLN--SAG--LLS	1467
LIMPET	-----FSDLFS--LLTNLSLN--NPVVGHTVQLHVLVSGYILLN--KTG--LLV	1438
SCALLOP	KT--LS--GRRDLGS--YLPJLTL--DLKLDIYLLQQLLGGYHQLH--TAG--LMT	1489
LINGULA	SKLDS--GSYNLLK--KLPJHLS--GPSDHMTDSHLVAGYQLLH--KTD--PLL	1475
OYSTER	RL--LQ--GDRDLGS--LLSRPLD--DPSTDHVFLLQQLVSGYQLLH--SVG--LLS	1462
SNAIL	QE--LK--GRGDLFG--QIPJSLT--SSSIDYTNLQQTVEGYCQLH--DVR--ILL	1469
SPONGE	SNINT--GQTNVIN--RLPVSY--NESTTSSGILLFNRLVQGHYILA--ESNK--CLS	1471
PRIAPULA	RSLSE--K--KYN--ILPRLPC--LMTDTGDDTRYLSSLVCGYQLY--KAE--LLL	1480
DANTO	MRTK--QSVELCA--I--DL--YETDRNSHASNMLLSACKQLH--QSG--LLN	1475
ESHARK	KRITA--QSIEALCN--V--DL--YSPGARTDHAGRLSILSACKQLH--KAD--LLN	1472
BSHARK	KRLKS--QSIEDLGN--V--DL--YSQ--SDHAKLNSILLACKQLH--KAG--LLN	1471
XENOPUS	KRVTL--QSIEELCS--V--DL--YDPGARFNRVKGSLVLSACKQLY--KAE--FPN	1489
STERLET	RRISY--KSVEELCG--V--DL--CNVDARSRARLAVVLSACKQLH--KAG--LLN	1488
GAR	RRVSQ--QNVQQLCA--V--DL--YGEARSEHARLALVLSACKQLH--RAG--LLN	1475
HUMAN	EKITA--QSIEELCA--V--NL--YGPDAQVDRSLAAVVSACKQLH--RAG--LLH	1465
PLATYPUS	KRVTA--QSIEELCT--V--DL--YKPDARFDRPRLASILSACKQLQ--RAG--LLH	1469
TASDEVIL	KRITP--QSIEVICA--V--NL--YNSDARFDRANLASSILSACKQLH--KAG--LLH	1472
COELACANTH	KRITA--RSIKELCS--V--DL--YNPDARLDHIRLGSILSACKQLY--DAG--LLN	1476
CAECILIAN	KRITS--ESIKDLCD--V--DL--YQDARHYHARIGSILSACKQLH--KAG--LLN	1478
CANARY	ERITP--QSIEDLCS--V--DL--FNSEARLDQVRFAGVLSACKQLQ--KSG--LLH	1467
OSTRICH	ERLTP--QSIEDLCS--V--DL--FNSEARLDQVRFAGVLSACKQLQ--KAG--LLH	1437
GECKO	KVITP--ESIEEFG--V--EL--YNSDARLDHVRGALLSACKQLH--RVG--LLH	1476
TURTLE	DRITS--QSIEELCS--V--EL--YNPDARFDRVRLSILSACKQLH--KAG--LLH	1476
ALLIGATOR	KRITS--HSIQELCS--V--DL--YDPDARFDRVRSILSACKQLH--KAG--VH	1434
APLYSIA	RL--E--TECNLTS--SLPLDLS--S--ASLDYQLSQMVGGRQLH--AAK--LLM	1486
TRICHOPLAX	ELLSR--NRSYNLDP--LLPFRPD--RDNELNIDFERLTFPLIKGYKOLL--TMG--ILK	1459
SOFTCORAL	SKISL--GGRCNLFE--LLPLPLS--GEECDQMDHTRLQLLVGYQQLH--RAE--ILL	1473
STONYCORAL	KKIAL--GSHCNLFD--QLPFPLS--NPQEHQVCLRLAYLVQGYQQLH--CAG--LLL	1466
SEA ANEMONE	-MFLG--FSRCNLFE--KLPJPLA--GE--DSRVHDHLYLHSLVGTGYKQLH--AAG--LLM	1490
SEAUCUE	KRTSS--NRNEDLLA--MLPSVFE--NVRSGQYHANSLEHLISGYKQLQ--RAK--FWP	1483
LANCELET	AKLSR--RSSHDLFS--HLPEVSA--GV--AELDHVRLTLMVSGYQQLH--NAG--LLL	1498
STARFISH	RSVTK--SSHDLTK--LLQSMFG--RDEGLTTHGKLIHLVKGYQQLH--QAN--LLS	1505
SEA_URCHIN	KRITA--RSSEDLFS--LLPMLFS--NESDLGLDHWQLHVLVNGYKQLQ--KAK--LLT	1498

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	SNNF-----POE-----CIDQLG---QVVINFE--	1429
TETRAHYMENA	YTR-----YIEK-----AI---S-----GILNGVK	1482
STYLNCHIA	--LA-----SIDP-----NI---K-----EYLISFR	1460
APHANOMYCESa	GESSSR-----RRDI-A-----CDFARLA	1367
APHANOMYCESa	HD--Q-----QEDI-A-----NDPANMA	1333
PYTHIUM	--LSK-----LTPH-V-----DNFVSLA	1444
PLASMOPARA	---SSA-----ADNY-A-----EIFALVA	1429
BREMIA	---FPE-----ADKH-A-----EMFALIA	1415
AEDES	YFSSGTIDFL-----ETISNKLH-----NIFNGLK	1480
MIDGE	-FDALAQQL-----VKTAEVLLK-----KLFQCVV	1442
BOMBUS	QLD-RMK-E-----LINRQDTPV-----RIFKALV	1373
ANT	OTILETH-G-----FANREHMVD-----QIFRFLV	1392
WHIPWORM	Y-E-IIL-----NC---D-----NVMEVLI	1437
TRICHINELLA	V-V-ELP-----RA---E-----FLWTTVA	1451
BEEBLE	FTVGRVA-----PIL-----NKFLQPA	1378
BARNACLE	S---AAPAEL-----RVSGEE-----LFAVVM	1387
THRIP	SVFKETQMS-----GLIGERSLV-----AVFQAIV	1387
FLEA	SYVTRSKFWS-----SLANGQYIT-----NIYNGLI	1388
WHITEFLY	SFLMKVLKDK-----SFSTVNLYQ-----KIFNSLY	1425
TICK	---RVPDLL-----AARALVR-----SL-AELL	1434
TERMITE	HIVKELPNQY-----GLDGNQIVK-----HLFSALV	1454
DAPHNIA	AHFPCKSS-----SALL-----KLAVERNANPTSINFSGST	1339
OSTREOCOCCUS	RVLMBEGNTSA-----KVLAE-----VALSRVC	1447
STENTOR	KVT-----BEP-----AKRMB-----SLI	1264
KLEBSORMIDIUM	SILPKRL-----GEL-----AEKLAT-----AVFNLRK	1563
CLUBMOSS	PTLTKERS-----EQL-----SERLLH-----TVYTIK	1406
MOSS	LVLNKVRA-----GKL-----GERLLL-----TVFGIEQ	1492
LIVERWORT	SVLGKKEG-----KOM-----GEKLLA-----RVFQFGR	1514
LIGNANO	DSTADEK-----RQILD-----RCC-----RCC	1549
COPEPOD	SPW-----N-----GVQLLN-----ELLSKLP	1419
GLOBOSUM	AVLM-----AKS-----VS-----SRQYMA-----LVLRSGL	1380
PALUSTRIS	AVMD-----TRA-----MD-----TSANIV-----KLV---C	1432
NEOCALLIMASTIX	DIKYNN-----IS-----EYNYFQ-----YVLNCL	1501
GLOMUS	DLLEHEMYSYMNTS-----SK-----LYDYIL-----AIWKKFN	1548
LOBOSPOR	S-----MF---DGSS-----HK-----ACHYIA-----SLYEVFM	1480
SYNCEPHALASTRUM	MVCRQKNT---AGHA-----SS-----ERAFVE-----DMFDKFL	1463
FUNCTIVORUM	---LPRKQQT-----LKRI-----SHDLS-----QVFDSSQ	1436
HALBUM	VTLKPAKL-----SLPAM-----TSTLPD-----YLNHEVD	1575
DURPUREUM	SILLENNKTIINNSSNNNTLPESSTEP-----STPIIN-----YLFNHCE	1591
PVIOLACIUM	TLLEISNSTAQTAQSTL-ISKCTNSQSF-----ANLME-----YLFHST	1577
AMPHIPOD	SLG-----S-----T-DDL-----ARHVTR-----WASDFLI	1494
SHRIMP	KCN-----V-----VSYSV-----AKELVD-----WLCGSIF	1472
MUDCRAB	QCS-----V-----IRKSL-----ASELIM-----WVCNSLF	1471
TARDIGRADE	DYL---QTKKL-----TSEQF-----ATKLIQ-----HVNASLTMK	1504
HYDRA	HLL-----SVDV-----TDL-----KKKLE-----SLDLSL	1438
SALPINGOECA	ECF---FTDR-----DAF-----GRELFA-----ALFEYS---	1466
SPIDER	NDL---FNNP-----DKS-----LNNLLD-----SIWTDSS	1482
LIMULUS	VGG---RKDS-----SAEPI-----SRELLN-----AVWGCVC	1480
SCORPION	KQN---CNKS-----KKL-----ACDMLS-----SVMESCI	1482
ROTIFFER	ITP-----DM-----SK-----FVFDLSQ	1493
CIONA	RIPQEPNKPPIGAN-----NVTSA-----SEALIA-----SVFDSVV	1486
OCTOPUS	DMN-----LESL-----AAKLFH-----NVSONIV	1456
CAPITELLA	NTL---VSKSS-----EKL-----AEDLVN-----TVFMGMV	1491
LIMPET	NTN---VQQLV-----FDTVYKVCYPOFFLGMNIPVS-----VPFSGIY	1475
SCALLOP	SVH---LGSQK-----A-SDL-----AQKLPD-----NVFQGVV	1514
LINGULA	PAL---KDGGH-----SAENV-----SNNLQ-----TLFQAVS	1501
OYSTER	KVS---MATTL-----P-D-L-----ANKLLE-----YVHSSLI	1486
SNAIL	EVL---GKHGQ-----P-EKL-----AELLFD-----SVLRGIT	1494
SPONGE	DVL---KSMGT---S-----EESL-----AMRLYTNAL---TIIRGIS	1501
PRIAPULA	PAL---QEAA-----PAL-----PASLLT-----SVFEGCT	1503
DANTO	SVL---HSQDA---S-----YGCSL-----GSKLLT-----SVYKSTIA	1502
ESHARK	SAL---DCEAG---S-----LSSSL-----SLKLS-----VYKSTIA	1499
BHARK	SVL---KCQIG---S-----IVPPL-----NLKLS-----TVYKSTIA	1498
XENOPUS	SIV---PEQVG---G-----Q-RF-----GSKLS-----VYKSTIA	1514
STERLET	SAL---SQQA---S-----FGLSL-----GSKLS-----VYKSTIA	1515
GAR	STL---SQQA---S-----FGLSL-----GSKLS-----VYKSTIA	1502
HUMAN	NIL---PSQST---D-----LHHSV-----GTLLS-----LVYKSTIA	1492
PLATYPUS	AAV---HPQAS---H-----LQRPG-----STKLS-----VYKSTIA	1496
TASDEVIL	STV---ESQAT---D-----LPHPI-----GTLLS-----VYKSTIA	1499
COELACANTH	SAV---YQSG---D-----FNLQL-----GSTLLS-----VYKSTIA	1503
CAECILIAN	SVL---SQQA---G-----LQFTV-----GSKLS-----VYKSTIA	1505
CANARY	SVL---HQDE---G-----SHFSV-----GSKLS-----VYKSTIA	1494
OSTRICH	SVL---HQDE---V-----PHFSL-----GSKLS-----VYKSTIA	1464
GECKO	CTL---SQQV---G-----LHCEA-----GSKLL-----VYKSTIA	1503
TURTLE	STL---SQQS---G-----LHPTV-----GSKLS-----VYKSTIA	1503
ALLIGATOR	SVL---SQQS---G-----LHPTV-----GSKLS-----VYKSTIA	1461
APLYSIA	DQLPAAATAGT---T-----SKADL-----ASLLD-----NVFGLV	1516
TRICHOPLAX	TTP---ADH-----KDL-----IEKIMK-----SVVDCFR	1481
SOFTCORAL	PAL---AKEGE---W-----SAEKC-----SEELLK-----SVFQGF I	1500
STONYCORAL	PAL---KAQAR---N-----ASEEY-----AVKLF-----AVYDGVK	1523
SEA ANEMONE	DVM---LTRGS---T-----KPLEY-----GSRLN-----AVYEGAC	1487
SEACUKE	LRS-----AD-----GSEIVE-----EVFKALR	1501
LANCELET	PA---LGTNS---G-----KSL-----ASELVS-----AVFKSMV	1522
STARFISH	AAT---TGHS---G-----SSF-----AVKLF I-----TVFDSL T	1530
SEA URCHIN	RQT---TNQAL---S-----ILD-----FVMRGLV	1517

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLTA, EXPANDED

PARAMECIUM	--Q-----GNDQIN---NIE--YVTHLFEFL-----LSE-QRAK----	1455
TETRAHYMENA	--SS--E---EMLNKQDSLF-RESRTOQIQFALD-----ISS-ESTN----	1517
STYLONCHEIA	--SLPTIV--EAWFDIDTPIS--NESARVLVKFLSKLE-----I----PN----	1495
APHANOMYCESa	--IDK-----KASGLLTPMQ--DQLTHRAMEMTAMDG-----WADVTFIL	1403
APHANOMYCESa	--IAE-----RKNNTRSPIR--DQIARTAMQTAIEMG-----WDLASFIL	1369
PYTHIUM	--TRA-----LGGASVDPND--RLALELAIKAGCFGG-----WDMTRVFD	1480
PLASMOPARA	--RKI-----VEYGHGSQPD--RLVVVAALQAAAASE-----WNITDIFL	1465
BREMIA	--SKV-----LDHGNAGPHD--RLVIAAALKGAAACG-----WRITDIFL	1451
AEDDES	--RERLDE--LHVVDLTPSV--KRFFSCLHIVLFFKS-----TGTM-ELLVEFML	1524
MIDGE	--EEKLVN--KRPKLLTPSA--KAYASNIQLCLKI-----NDFL-STTVTFSS	1484
BOMBUS	--RESLGE--LIVVTKPSA--KDYLELMEFSLHY-----EFSMT-RMLIEFIE	1417
ANT	--SERIGE--LVCRLSMRM--TEYLRALMEFOSLSLSTIIGNLSLTP-KKLELTI	1443
WHIPWORM	--NSCVGREAVILRSTSLSTK--VGLAKRLLDVPQSA-----AQI-KSLIHLIA	1483
TRICHINELLA	--DVYFS-----KRIGLPPSK--LGMVKRIFRVAALTG-----SAV-DVLIXLIM	1491
BEEBLE	--EDKI-----IFLDLDQDIT--LSYCVLNYSLSDQ-----NEF-KVFPVOYLY	1418
BARNACLE	--ESCGRQ--PPT----DPMT--VRLADTALLETALG-----VPA-RRLLSALL	1426
THRIP	--EPVINS--EHKAPVSLNPTA--RMYAQMLFEYFSTC-----PEL-NQLINNIL	1431
FLA	--EENT--DtdTKIGIPFHVINIYKGLSVIFEHV-----DCK-DLLIESVL	1432
WHITEFLY	--DSNG--TT---VHLSEKD--TDFLRSLSLDTLLD-----EEV-ELLSGFIF	1464
TICK	--RSRG--AD----WPLG--KELCLRVLELAALG-----AQA-RDVLEAL-	1470
TERMITE	--EGQG-----DMKRTVVLPAA--FSYAESLLKFAFLLN-----KEV-TTVICCKI	1496
DAPHNIA	-----GDSVSSAV-RLRASSLIVLEALLIG-----LSM-EVLSNEFR	1374
OSTREOCOCCLUS	-----GLGHHANPQR--RVVGDIVKCLLHLM-----LAP-NVLDFPLL	1483
STENTOR	-----SKDSHE--ARKGRMELFELTKK-----IE--EKQLETFVL	1295
KLBSORMIDIUM	-----E-CPPPL--RPVATAMLLETALG-----LSV-GRLLDLYS	1595
CLUBMOSS	-----EPVSPLA--EPLYVEILRLSVALR-----VWV-DQLLRIVL	1439
MOSS	-----E-CPPSL--OPTAEMVNLMASLG-----VNA-TFLVNILM	1524
LIVERWORT	-----E-FPPL--ETIASVMVLSLALG-----TSV-QRLVELCL	1546
LIGNANO	--QLAESA--OTTQHPV----LPOLIDAAITYA-----LND-SALLQPLV	1586
COPEPOD	-----E-KTLNKISPD--LKNLEVFIIQLVDE-----SDSEHIAARLM	1456
GLOBOSUM	-----TISKSDLLQ--IQLARNMWBEICNN-----ESQ-EDAFSLIL	1416
PALUSTRIS	-----SLRETPDPT--ILVVGGLQVCLMHR-----SSR-ERYFSEIL	1468
NEOCALLIMASTIX	-----KLDNENPSY--DLIKOLLIDICINS-----EIQ-EECWGKLL	1537
GLUMUS	-----NLRVSDPLW--VELIRKLLSFALSLS-----KYN-GAINQWLL	1584
LOBOSPOR	-----SMQSTRDPLW--INYSALLQPSLGER-----QCR-ORLWDYLL	1516
SYNCEPHALASTRUM	-----EMQSSDPLR--LKLVDVMRVA-GNS-----LCS-ESPYCRKL	1498
FUNCTIVORUM	-----VTPLE--QMGSLVQLCFR-----DVPSDVDFKLF	1468
HALBUM	-----NITPAH--LIVYKELIVFILLSTG-----HIQPSKLLYELL	1608
DPURPUREUM	-----NLSPSK--LLSKELIQLVFTIG-----IEPQKLSMII	1623
PVIOLACEUM	-----KLSPSR--LLVFKQLLVLVFTIG-----ISSDKLLSYII	1609
AMPHIPOD	--TNPQRS--VAAFAPISHQ--ITSFASTALHVALQLR-----E-----	1528
SHRIMP	--KEQLS--VSGI-SPHPSL--LKFLYTMQLAITLD-----PKVKHLLSWAT	1515
MUDCRAB	--MYG--SAS--SPHPTQ--LPFLHVLDFAVTLTD-----SQVLELLVQVT	1510
TARDIGRADE	YANGSRK--EAWI--STD--VSQEKALFSLALQCO-----SSGASAAAF--	1544
HYDRA	--N---K--EKVSPFLPAQ--MLLANSRFLRYLEIN-----PSA-ALTDLPV	1475
SALPINGOECA	-----HTSTPEPTN--LAMAGLADLALSLS-----VPR-SQLLAMLR	1501
SPIDER	--ICCVSI--NKNIALNPAS--LNLAEKILKVAKMD-----LQV-QMLAKALL	1524
LIMULUS	-----GNVDGS--TFVATLNPPT--VALMEKLLDITFLLN-----TOP-DYLIKELL	1522
SCORPION	--LETEIG--CCPILNPV--LNFQKMLTVALKLD-----ISS-EDLLAKLL	1524
ROTIIFER	--EETESQ-----TT--TEARKRLSCLSLIN-----RNF--LTKLL	1524
CIONA	--KLDDE--EALTDQEVTPHN--IQLGNKILQLSLHMA-----EAKKLLVNCIF	1531
OCTOPUS	--THSDDN--QLTSRTPPTE--LSLTOTLLELAQLS-----MPI-NEPMVAMF	1499
CAPITELLA	--TAVDVG--PTLVNLSPV--QSLAEKMLTALFQMG-----YPE-KNLVELIF	1533
LIMPET	--EEKGL--KKIITLTPAA--SILGKSLDLSFKLG-----LKD-NVLITALL	1517
SCALLOP	--CRNGGG--LEAITLTPVV--HTLMKMLALSFLHG-----LQG-SVLEAIL	1556
LINGULA	--EE-DQ--FRLLECPST--LELSRKLLELACSMT-----DKP-AQILGAIL	1541
OYSTER	-----CVEGGT--KKSQTPSPATA--QVTATMLLELSPCLG-----VQI-KKVMCIL	1528
SNAIL	--EKKDGG--DKTWSLSPAA--HRFASQLKLAFQLG-----LPA-EKLVREGIL	1536
SPONGE	--SSPGDG--T-PGYMPLH--KLTGELLLKLGLELS-----DSV-EPFLLLVL	1543
PRIPAPULA	--LSPRDG--VSSLTGMSPSV--RELGGRMLRLAFTRK-----VES-DSLLESLF	1546
DANTO	--PCTDRK--SLPSMDVGS--RKLADRLVQLSPCLG-----DOS-EQTVGLLL	1543
ESHARK	--PGDERK--SLPSIDVGS--KRLADGLLQLSFLG-----GQC-EELVSLLL	1540
BHARK	--PGDERK--SLPTMDSV--KMLADGLLQLSFLG-----GQC-EELVSLLL	1539
XENOPUS	--PTNERK--SLPSLIDIS--KRLAEGLLLELAFMFG-----GQC-EELVSLLL	1555
STERLET	--PGDERK--SLPSMDVGS--RKLADGLLQLSFLG-----GQC-KELVDLLL	1556
GAR	--PGDEKK--SLPSMDVGS--RKLADGLLQLSFLG-----GQS-EQLVSLLL	1543
HUMAN	--PGDERQ--CLPSLDLSC--KQLASGLLELAFAFG-----GLC-EELVSLLL	1533
PLATYPUS	--PGDERQ--SLPSLEISS--KQLASGLLELAFAFG-----GLC-EELVSLLL	1537
TASDEVIL	--PGDERT--ALPSLEISS--KRLASGLLELAFAFG-----GLC-EELVSLLL	1540
COELACANTH	--PGDERK--SLPSIDIS--KRLADGLLQLAFSPG-----LQS-GELVCLLL	1544
CAECILIAN	--PGDERK--SLPSLIDIS--KRLADGLLQLAFDGL-----GQC-DELVSLLL	1546
CANARY	--PGGERM--SLPCLDLR--KRLADSLQLAFAD-----EQC-EELVSLLL	1535
OSTRICH	--PGAERL--CLPSLIDIS--KRLADGLLQLAFAD-----GQC-EELVSLLL	1505
GECKO	--PGDERK--SLPSLDMS--KRLAEGLLQLAFAFG-----VQC-KELVSLLL	1544
TURTLE	--PGDERK--SLPSLIDIS--KRLADGLLQLAFAFG-----GQC-EELVSLLL	1544
ALLIGATOR	--PGDERK--CLPSLIDIS--KRLADGLLQLAFAFG-----GQS-EELVSLIM	1502
APLYSIA	--QTEDRT--R-TAATLSPATA--QTLANALLELSQLS-----FDV-DKLVAKIL	1558
TRICHOPLAX	--GEMNG--DRITALSPAQ--QKVAAELLDFAFELN-----ETI-DIFFRYLL	1522
SOFTCORAL	--VQDS-D--VFRIVNTPAS--RELAKLLDLAFDLG-----LKI-ESVLHCIL	1542
STONYCORAL	--PSLVNG--L-QTVILDPA--QHLACKLLDLAFDLG-----LQF-NYLMSIM	1565
SEA_ANEMONE	--RAAVRT--SGSIIVLPAS--HQLACKLELAFDLG-----IEV-ITIFRRAV	1530
SEACUKE	--TSED-G--RDVAVSLRPAE--IELGTLLLELAFQMG-----VKV-PILVDLLT	1543
LANCELET	--TRKD-G--HPTAASLPPSF--HQLTGLLQLACQLH-----PQG-HDLLDCVM	1564
STARFISH	--TSDEAG--KLQANITPLS--VELAESLLDLAFLLG-----IEA-KMLVSCLL	1573
SEA_URCHIN	--KRGENG--Q-EARKMTPSE--IDLQRLLELAFQLG-----VQT-NSLIDCLL	1559

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----NFVISNLIKASDPFRQKYEPLAFVARNP-	1484
TETRAHYMENA	-----EFILQIISQQSQPFQKYNQLLTVKSKW-	1546
STYLNCHIA	-----ETLCEWLTKKHLLYQKSSDLLSYIAENW-	1524
APHANOMYCESa	QPTPAN-----YTLFSAAFDKVCFDRDDVWL-	1429
APHANOMYCESa	KSTDEN-----YDLFASTFDSSL-HKSSIWL-	1394
PYTHIUM	DRDLRR-----KLSIYRDIILLPHRHWS-	1506
PLASMOPARA	KSADRR-----MYASISYDVHMLPTLAVWK-	1491
BREMIA	KPYDRQ-----KYAFIYSDMTHVIAASLAVWK-	1477
AEDES	NEQKRLRYQOS-----VNSTILHGEHFVNTFDQVIFEYVIQRL-	1562
MIDGE	NDMQLM--IS-----QSSSIRHGEHF IETFKQPIFKLFTSNI-	1519
BOMBUS	NDTMLGS--GD-----K-KIKHGVPFFSTFKCEIFRYLLKDI-	1451
ANT	NDPFTVS--DC-----T-IKYGHEFLANTFESVIFKMLTHE-	1478
WHIPWORM	DCQPVRYL-NP-----SSIAITKRNDAPVSLPFEETIAYVLCRNA-	1520
TRICHINELLA	NTESVRLA-EC-----TSLCSTKGGELLIANFSDEIALILCTNA-	1528
BEEBLE	KDYKVTQT-NC-----KQP-ISFGYTLFTIPEDTIIRKVVNTNF-	1454
BARNACLE	SEEQVRAG-----SGS-AERGWLFSSRFSAVLVPHLLQPA-	1460
THRIP	DRSPLSOR-DL-----QCS-ITHGHEFVACFEAVLVPRLLGV--	1466
FILEA	NDVHIIGN-IT-----ESK-LAHGQHFYSIFGNQIKYLMRF--	1467
WHITEFLY	KTDQARLK-DS-----LRP-VTQGDHFKYLFFRQIISRFSDS--	1499
TICK	-----LP-SQ-----AWE-VL-GAQLCRHF---AERASDYV-	1495
TERMITE	EQASIQNP-AT-----HSS-VLHGDYFFVTF---RS---AIL-	1525
DAPHNIA	NPANIPGA-----IITYGQYLRSKLGHVFPVVINQM-	1406
OSTREOCOCCUS	DRRGP-----NSGQLGREALYRNFRSEFIRKCEFPQ-	1514
STENTOR	AN-----SKLFGSMBELLYEYMSRNM-	1314
KLBSORMIDIUM	DESEVVSQ-GGVPEAQ-----GDPTPGMVRRTGALFLNSRSDVIFKCVFQP-	1643
CLUBMOSS	DKNGD-----TVDRGTDVSTPGGRPYLSFRKVVVQVQKFFY-	1475
MOSS	DEKSV-----GIST-NRKLTSGEVYPMNFRDTIVHQQVFFY-	1559
LIVERWORT	DEETI-----SLPQTRKAMPGGIFYLNFRRLVQOVRFPP-	1582
LIGNANO	T-----LLTEHSAGLDLLNSYKPLTAYFSANC-	1614
COPEPOD	EI-----ISSDREKDVWFIRTFMMLCHKPILLNM-	1485
GLOBOSUM	N-----PP-----VSGTDDAMVNL-KNLAPTIV---SHAV-	1441
PALUSTRIS	C-----LE-----NEKDAETAIKFYQYASYINSLLRNF-	1498
NEOCALLIMASTIX	G---LS--TM-----TDLKYSVDVISFYSKYKFINYLFINF-	1569
GLOMUS	SDIIGFPS-DN-----STFYQNGTICYQKFSVINEHMSRNF-	1621
LOBOSPOR	-----DN-----EHF--EQAQMILYLYADVINRQIALHF-	1543
SYNCEPHALASTRUM	-----LS-----NDLSDPERVTVYKHEFHYINACALHF-	1527
FUNCTIVORUM	DARTIQGG-DQLPSL---GTMELGSVNEAGRVRIQSMTRGEEYVYKVDALRYTLRHR-	1524
HALBUM	PPIKVLTK-STTTTTTTSSTITDKLEEEKRXQQIEHOSNFYKTYHSELLEYISKNP-	1666
DUPURPUREUM	NESNPKKS-KDVDANNQ---GD---GEDSIHVXKINDIPYKSLFTEINTYISSNF-	1671
PVIOLACEUM	DPTVKDKK-DKXDDNNN---SDKMDTDDKPEPPKDSRYDIPYKYIIEINTFVSNHF-	1663
AMPHIPOD	--ETVSEV-LE-----LVIAAGDEPL-VHADAVMTVLVLR-	1560
SHRIMP	NSDTVSGT-SG-----QEVEKGSVLSILGPKLIPQFLESP-	1550
MUDCRAB	NMEDVKGV-TG-----QQIEKGFHLLNVLGNKIIPHILPCC-	1545
TARDIGRADE	-----ISHSHTQVSIYSKLRSVVFYTLFPDPTA-	1571
HYDRA	NEK-F-----SQNTRSRGLVLYDLRSLVINIYDIP-	1506
SALPINGOECA	DDTPTPQA-GHLSL-----TMLASASKSATOTTRGALFYDTYRTVLAPYIARHF-	1549
SPIDER	ETTEEHS-----KLVVTKGLLVFNLFNLSISLFAVESA-	1558
LIMULUS	VTDNVLT-PP-----DTYSRGLGLVPLGFAKISRYLAKTA-	1558
SCORPION	DEQQLYVS-NL-----KTKTRGLIMFSTIQQELISLFAGINS-	1560
ROTFIFER	QNYLE-----QSANVLSYFRABITFQCLAFY-	1552
CIONA	SNKOVATL-NP-----DVESHRSKGLLPLSTYSLAIYKELCOHP-	1569
OCTOPUS	TEEAHQ-----QN-TSCQGLLILCFKQVSGYIEHA-	1530
CAPITELLA	NSNNHGV-ST-----SVQCSPHGTLFYAAFVSVNLFVKS-	1570
LIMPET	NDDMIQGG-TP-----SVN-LQHGEAFFLMSFKVICQYIAENG-	1553
SCALLOP	DQTLVSGS-SK-----GLE-QCHGDLVFSMFKSVIAGHMVAVES-	1592
LINGULA	SK-----TK-----TKN-QNSQNFYAMFQSTINLYLMEKA-	1571
OYSTER	DESMVEGT-AK-----GYS-QSHGELMPTAFKTTVSVHLAKAM-	1564
SNAIL	DIRIQGL-SL-----GIE-YMLGDHFFTLFKPTISSHVAASS-	1572
SPONGE	SPAQSAG-A-----SFA-AQDGLLLLYITYSGLINNKLLLIH-	1578
PRIAPULA	DDTRLLGV-SA-----KQ-TTKGSMFYSTFGHEINNHVLGMA-	1581
DANTO	NTITLSPV-LS-----GSLNPHFLS-FSHGEYFYSLFTQTSINTELLRSV-	1585
ESHARK	NTMELSPV-LS-----CAQXKMPIT-FSHGEYFYSLFTQTSINTELLRSV-	1582
BSHARK	NTVLSVP-LS-----GASORHPIS-FSHGEYFYNLFPETINSELLRNL-	1581
XENOPUS	NTVLSVP-LP-----GTSORNIIN-FSHGGYPYTLPAETINTELLNLL-	1597
STERLET	NSIMLSPV-LS-----DTSQKNPIT-FSHGEYFYSLFTQTSINSELLKNL-	1598
GAR	NTIMLSPV-LS-----GTSQKNPIS-FSHGEYFYSLFTQTSINTELLGSL-	1585
HUMAN	NPAVLSTA-SL-----GSSQGSVH-FSHGEYFYSLFTQTSINTELLKNL-	1575
PLATYPUS	NTVLSVP-LA-----GTSORNLIS-FSHGEYFYNLFSATINTELLKNI-	1579
TASDEVIL	NTVLSVP-LS-----GTCQKNLIN-FSHGEYFYSLFTQTSINTELLKNL-	1582
COELACANTH	NRVLSVP-LS-----GTSORNFIT-FPHGEYFYNLFPETINSELLRNL-	1586
CAECILIAN	NTVLSVP-LS-----GTSORNIIS-FSHGEYFYSLFTQTSINTELLKNL-	1588
CANARY	NTVLSVP-LS-----EASQQLMN-FSHGQYFYSLFTQTSINTELLKNL-	1577
OSTRICH	NTVLSVP-LL-----GASRKNLNV-FSHGEYFYSLFTQTSINTELLKNL-	1547
GECKO	NSIMLSPV-LS-----GVSRNLIS-FSHGEYFYSLFTQTSINTELLKNL-	1586
TURTLE	NTMELSPV-LS-----GTSORNLIS-FSHGEYFYSLFTQTSINTELLKDL-	1586
ALLIGATOR	NTMELSPV-LS-----EAPRNLIS-FSHGEYFYNLFPETINTELLKNL-	1544
APLYSIA	DKSSVQGA-RK-----NIE-IGHGDFPLTFTSSTLASHIMTSSA-	1595
TRICHOPLAX	DETKLYGD-SN-----SAT-ATLGMVLYTFNSNINAFKAVS-	1558
SOFTCORAL	NKSLADA-KG-----SS-STVGMVYQTFHNTIEHLLIKNS-	1577
STONYCORAL	EDSND-----NFG-SSCGCTFYRIFQTSINGFFIERA-	1596
SEA ANEMONE	NILLI-----Q-----MICFLFSDG-SSVGAVFYTTFQASINTYLIKNA-	1568
SEACUKE	KEDRVN-S-----TTE-IPHCEVYFAAYKSALNDELACQS-	1578
LANCELET	NKTPMTG-GGK-----KSS-TFQGMVFFSTFKSCICQQLIKTC-	1601
STARFISH	DKTALFSG-RS-----S-TSKGAVFYTTFKTKLNGEMAVQA-	1607
SEA_URCHIN	ETTPVSS-TRS-----LTSKLSAQ-TSLGVLFITYKQIPMDQLVRHG-	1602

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----ESI---GQIYFQY-I-----C-----	1496
TETRAHYMENA	-----NLI---GQKYLML-A-----K-----	1558
STYLNCHIA	-----NHFKLNNGEYLIIK-A-----K-----	1540
APHANOMYCESe	-----QVV---RGLLSHVQ-----	1440
APHANOMYCESe	-----NVA---VGFMSNIE-----	1405
PYTHIUM	-----RVA---KLLITDDI-----	1517
PLASMOPARA	-----RCA---SKLVLSL-----	1502
BREMIA	-----RCA---SELASLSL-----	1488
AEDES	-----PESL---NLILDR-L-----S-----	1574
MIDGE	-----KETI---QLLVNE-M-----K-----	1531
BOMBUS	-----EKS1---E1FNLD-L-----Q-----	1463
ANT	-----RMTT---VVCNDM-W-----R-----	1490
WHIPWORM	-----TEPI---EEGIRA-F-----E-----	1532
TRICHINELLA	-----ELFL---KHLKEA-S-----R-----	1540
BEEBLE	-----DVFP---TY-----	1460
BARNACLE	-----A---REAV-L-----S-----	1467
THRIP	-----HHQT-V-----S-----	1472
FLEA	-----PIDA-V-----K-----	1473
WHITEFLY	-----FSKA-V-----H-----	1505
TICK	-----PAAL---ALAEG-----	1504
TERMITE	-----EHML---ACFEHS-V-----S-----	1537
DAPHNIA	-----TSVL---PFIPOE-G-----	1417
OSTREOCOCCUS	-----DDYA---TDLLITTS-----	1526
STENTOR	-----ESSG---GVFINSMAGKPEKMFELVPFLEKAKRLIEAKEVNLTIPLKNFI	1364
KLEBSORIDIUM	-----RAL---ERLFSQ-T-----	1654
CLUBMOSS	-----KKCL---PVLME-S-----	1486
MOSS	-----KDCL---RLILEA-A-----	1570
LIVERWORT	-----RDCL---AFILKA-A-----	1593
LIGNANO	-----QSLL---TILAASPL-----L-----	1627
COPEPOD	-----QTLV---SKGVQ-----	1494
GLOBOSUM	-----CSYP---SSFIKS-M-----R-----	1453
PALUSTRIS	-----DQVY---DFPEKH-L-----Q-----	1510
NEOCALLIMASTIX	-----E1FN---KYLSPC-I-----S-----	1581
GLOMUS	-----REFA---KIFFDN-I-----N-----	1633
LOBOSPOR	-----VELS---PVISCA-A-----	1554
SYNCEPHALASTRUM	-----KAPA---PILLED-I-----E-----	1539
FUNCTIONORUM	-----AVMA---RVLASK-I-----	1535
HALBUM	-----ESFS---PLPIDR-I-----	1677
DPURPUREUM	-----ELFL---PLLNR-I-----	1682
PVIOLACEUM	-----ESFL---TLLANI-V-----	1674
AMPHIPOD	-----SYAV---QRCVQL-A-----Q-----	1572
SHRIMP	-----DDAL---SRCVEM-I-----R-----	1562
MUDCRAB	-----DLIV---TTLLEL-V-----K-----	1557
TARDIGRADE	LRSSDQRQLFF---YGLIGDA-----E-----	1592
HYDRA	-----LSL---QKGFND-S-----	1516
SALPINGOECA	-----KVFA---EQLLPH-V-----	1560
SPIDER	-----ENFV---KTIASN-L-----	1569
LIMULUS	-----NPSL---SLLVEN-A-----	1569
SCORPION	-----KHF1---SSLMNN-I-----	1571
ROTIFFER	-----SDIL---DFLSK-L-----	1563
CIONA	-----ALYI---PLITNH-T-----C-----	1581
OCTOPUS	-----AELI---PLIMAK-S-----	1541
CAPITELLA	-----EKFV---PLIMRH-L-----	1581
LIMPET	-----RTII---PILTNQ-A-----	1564
SCALLOP	-----DMCV---KSLATR-A-----	1603
LINGULA	-----KYFI---PELVNY-A-----	1582
OYSTER	-----AQAV---PVLCEH-A-----	1575
SNAIL	-----DVV---SLLMKN-A-----	1582
SPONGE	-----KMAI---DVLKLN-A-----	1589
PRIAPULA	-----TVLI---PKVLDK-I-----	1592
DANTO	-----DRSV---PILLS-S-A-----	1596
ESHARK	-----KSAV---TQLMKS-A-----	1593
BHARK	-----NSAV---AQLMKS-A-----	1592
XENOPUS	-----DTIV---VELMKS-S-----	1608
STERLET	-----DTTV---AQLMKS-A-----	1609
GAR	-----DSTV---POLMSL-A-----	1596
HUMAN	-----DLAV---LELMQS-S-----	1586
PLATYPUS	-----DTAV---LELMKS-S-----	1590
TASDEVIL	-----DTAI---LELMKS-S-----	1593
COELACANTH	-----STAV---SOLMNS-A-----	1597
CAECILIAN	-----NTAI---LQLMKS-S-----	1599
CANARY	-----DVFI---VRLMKS-S-----	1588
OSTRICH	-----DVII---LQLMES-S-----	1558
GECKO	-----DVAV---LHLLKS-S-----	1597
TURTLE	-----DVAI---LQLMKS-S-----	1597
ALLIGATOR	-----DVAI---LQLMKS-A-----	1555
APLYSIA	-----REIV---RSLMTH-A-----	1606
TRICHOPLAX	-----NRCL---PMLLDL-A-----	1569
SOFTCORAL	-----SEHL---PKILEY-N-----	1588
STONYCORAL	-----NIMH---ANILMK-A-----	1607
SEA_ANEMONE	-----QSHI---POLVSM-A-----	1579
SEACUKE	-----QHSV---RALLKE-G-----	1589
LANCELET	-----AESL---PVLLOQ-L-----	1612
STARFISH	-----QKVI---PLLVRE-G-----	1618
SEA_URCHIN	-----QDTV---YELSNR-V-----	1613

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----KETHLFRQGIIL--LVNKPQNV-----HHFKFPQ--	1525
TETRAHYMENA	-----DNISLLKLTIP--LLQSI IQSFNRK-----EKESLILLIQN-	1593
STYLNCHIA	-----DEPSLYAVPIP--ILEKLSOKTP-----NYYKILLRS-	1570
APHANOMYCESa	-----THPSF-IHTLHH--VLELTSSNNKML--SKRTELAPLVAPFAK-	1479
APHANOMYCESa	-----NYESCALNTFOR--VLEA-----NP-----KSSDGLAPVNDFAKY-	1439
PYTHIUM	-----T-TQRL-VGLVE--LLTEVASLKVHP--AGSSEMDFVDFLPH-	1555
PLASMOPARA	-----E-NDFVVNVLID--ILRQVACSKVYL--RKSAEWDAFTATLVAA-	1541
BREMIA	-----D-NDFVVNAFLD--ILRQVTSFKVYT--PRSDADWMTFKTLPN-	1527
AEDDES	-A-----N-N--FIAIVKWCN--FLEFLYQRKA-----EVP-ALKSVSEFLAK-	1613
MIDGE	-T-----T-NDTNRLRIVAVLSE--LNDYIFKHCTD-----NKE-LLDVNLQTMIKH-	1573
BOMBUS	-R-----DPSTLLMHEQ--LFLVQRK--E-FHD-CVEVLVDTVIKK-	1501
ANT	-D-----NSSFLKWTED--LLEFLRQHKR--E-LOA-HVMTVDVILIQ-	1528
WHIPWORM	-D-----NDEEPIQLCS--LLSCV-----VRSADL-RKC-YGSRIVDDVSL-	1570
TRICHNELLA	-C-----QPDVVGRAFPH--TVSVV-----VHSSDL-RKK-YGRELALQILQI-	1578
BEEFLE	-CLEYKDK-----IDKTVE-FIFYIL--RCIGLNK-HFK-TQHGIVNIVLTN-	1501
BARNACLE	-PLVSR--AAAHPRGVLTAVRT-----TAADRQL-RRQ-HGAPLARLLAEG-	1511
THRIP	-ALAEHLTPVSPQH--LTLILSS--IL--RWRCSVST-TRY-HLMQTVACLFSK-	1518
FLUA	-KTTITNLGDA-SPIKRHIVDFLIQ--ILYIYRNEK--E-NEF-LISNISETMLNH-	1522
WHITTEFLY	-HLITPDKI--HADILLAIMKE-----HECSPP-N-INO-RNSELVKCIFQK-	1546
TICK	-----APKMLTVMMSH--ML-----QDKE-L-TSR-RGSELSLEVMR-	1537
TERMITE	-CLIKDISAN--NVQWVISTVTE--ILQYAKIRKSKH-Q-DST-TCAPERSIVNH-	1586
DAPHNIA	-N-----GDSQQWALLLELQA-----ANQTO--R-----FSDKRKWI VQNVLDS-	1454
OSTREOCOCCUS	-A-----DVTSAAGRVATDILG--VVDRAST--LQCGGRMSLNGVIGRNAIEKMI	1573
STENTOR	KQTTPLFATLALVSPFSMGI TRAYCIPMBAKDL-SINFG-----THPF	1406
KLEBSORIDIUM	-----PRKTBALIGA--ILSHYLAG-----DKLSRASVDQMAAN-	1690
CLUBMOSS	-----VRNETARLILHA--VLDEY-----QG-----ETITKGSVFGEFLH-	1520
MOSS	-----AEKQAARMLLIA--LLDSYLPKSEMG--ASITKSFMQEFLQH-	1609
LIVERWORT	-----VGNRTARLLINA--VLDDIKSIEQG--SSLSRDFILKEMILH-	1632
LIGNANO	KAATAPATAAATARLPALAAILES--LAASV-KRTALSKQGC-ADDTPKQLASQILAK-	1682
COPEPOD	-----SGDILQSVQMLVNIILNRKQP-----GLGKELISHVMQH-	1528
GLOBOSUM	E-----G-----VEASFAIVLIDN--FLNWIE--TAE-----SKSEVEIFVGHAIADS	1492
PALUSTRIS	H-----P-----IVHTIL-LGIPD--YLI-VN--RTS--KADECRAPMDQFVKHS	1547
NEOCALLIMASTIX	E-----NIVTDIIND--CIDLINDYKSI--NEKIKSKFLIQISNQI	1619
GLOMUS	D-F-TRDQ--MNIDIKDLIN--LIDYLSKKT--QOSVEFLIHLNSEF	1676
LOBOSPOR	-----VLAIWND--FLDYMSHPE-L-----S-TEKDTFLDMLTKDY	1592
SYNCEPHALASTRUM	GDF-MPR-----VII--G--LVEYLKDNKRTL--A-KEINCFTELVS-S	1575
FUNCTIVORUM	-----AQSLAVRIVLVSHTASKL-----THPF	1559
HALBUM	-----VQTNHIDPILNDICIKYQTIQPNNTT--DKQSKNDKMSIMIPF-	1719
DPURPUREUM	-----IHTNHIIKVLNDVICILKQKQNEK--S--NM--SKD-IQSVINP-	1718
PVIOLACEUM	-----IQTNSIHKILNDICILKQSLSSOKLI--NP--KKE-ILSILGF-	1712
AMPHIPOD	-A-----GGWKAVALLLS--LARTLKDLSALR--KK-YSEELVRGVETT-	1611
SHRIMP	-E-----GRFLPAMGFASA--LITCLIRNADIR--KK-YSVKVVQSFLLK-	1601
MUDCRAB	-E-----GKFLVMSFNGM--LLNTLIRNSELR--KK-HSVKVVQAFLLH-	1596
TARDIGRADE	EHA-----GTWRSRHAVLKD--ALEYVCRNRPAR--KR-YETLEKLVMSQ-	1633
HYDRA	-E-----TLYSVHLLIQDI-LAEYVSKK-----SSVKNVQOFTFQ-	1551
SALPINGOCEA	-G-----D-G-RVYRLVHDA-ARALVTGDTM--RR-YADEFFTAFLDG-	1597
SPIDER	-N-----HQLFNEISILLK--FIDCVACSKILR--KK-HGKQVDAFLNN-	1608
LIMULUS	-K-----KPKVVPVPSILG--VLDIFSSNNKIR--KE-VGTAVVESLFS-	1608
SCORPION	-N-----KSKTIVLILVIG--LLDSIGKVKFR--TR-YGKDIINSIMCQ-	1610
ROTIFFER	-S-----SKFSKLOFLIN--FVEFIMQKHLR--KT-MQKLLKRVFES-	1602
CLIONA	-K-----ADASTCNPIITG--VLDYLATNRHAR--KO-HAASVCDLILCQ-	1620
OCTOPUS	-D-----SNSQIVGHILIS--VLDI-LKHKSFR--WK-HASQVCDIILKN-	1579
CAPITELLA	-E-----ANGETLSSVLIG--IAESVISDRPLR--KS-HGKMSRAIVSQ-	1620
LIMPET	-K-----THGRKVNILGA--TVDYIARDRTL--KK-EGPNVASTILSE-	1603
SCALLOP	-G-----ADGRKVSRLVA--MVDHVTRDKALR--KR-IGQNVKSVLMQ-	1642
LINGULA	-S-----KESVSVSVLSS--LLEQISDRDQLR--GG-EGKTVVDVVLSC-	1621
OYSTER	-Q-----KQCYRVMSILVT--MVDTVSKDKNLR--KQ-ISANVTVSVEK-	1614
SNAIL	-T-----VDPHRVSNVLA--MLENVAQDRIR--KS-NGPRIVDMVASK-	1621
SPONGE	-K-----THPQQVSVILNL--LLEYVQKDFKINNNNNEK-TVETLCTELISH-	1633
PRIAPULA	-N-----NRESVMTILTD--LLDQVGDRETR--KR-YGSGVNVTVLQC-	1631
DANTO	-N-----QNPMSVSVLLNG--MLDHSFRERSVR--KS-QGSQLABQVLKG-	1635
ESHARK	-S-----ENPKMVSIVLNG--MLDQSFDRHTVR--KT-QGVLVSAVLTN-	1632
BHARK	-R-----ENPKMVSIVLNG--MLDHSFRDRHTVR--KK-QGIYLVSAVLSN-	1631
XENOPUS	-L-----EDPKMVSIVLNG--MLDQSFDRHTVR--KQ-QGVKLVNAVLEN-	1647
STERLET	-A-----ENPKMVSIVLNG--MLDQSFERSVR--KT-QGSQLVGVGLGS-	1648
GAR	-A-----ENPKMVSIVLNG--MLDQSFERSVR--ES-QGRQLVKRVTAQ-	1635
HUMAN	-V-----DNTKMVSIVLNG--MLDQSFERRANQ--KH-QGLKLTATILQH-	1625
PLATYPUS	-V-----DNAMVGTILNG--MLDQSFDRDRVR--KQ-QGKLVDAILLQ-	1629
TASDEVIL	-V-----DNAMVGTILNG--MLDQSFDRDRVR--KQ-QGKLVDAILLQ-	1632
COELACANTH	-A-----ENPKMVGAILNG--LLDQSFRRNTRVR--KQ-QGSQVDTVVLQ-	1636
CAECILIAN	-V-----DNPRMVGITILNG--MLDQSFDRDRVR--KQ-QGKLVDAILLQ-	1638
CANARY	-I-----SNPQMVGSILNG--MLDQSFDRDRVR--KQ-QGAKLVAVLNR-	1627
OSTRICH	-V-----SNPQMVGSILNG--MLDQSFDRDRVR--KQ-QGKLVAVLNR-	1597
GECKO	-L-----DSPRMVGTILNG--MLDQSFDRDRVR--KQ-QGKLVDAILLQ-	1636
TURTLE	-V-----DNPRMVGITILNG--MLDQSFDRDRVR--KQ-QGKLVAVLNR-	1636
ALLIGATOR	-V-----DNPRMVGITILNG--MLDQSFDRDRVR--KQ-QGKLVAVLNR-	1594
APLYSIA	-S-----KEPRCVSRVLLA--VLDHALKDRSLR--KK-EGVAVCREMVS-	1645
TRICHOPLAX	-A-----SKSPMISGILSG--LLDFILDRGLR--QS-KGIHISKILSS-	1608
SOFTCORAL	-R-----DEAQVSSVTVIA--LLDSMVKDKELR--KM-NGRKMTTVLLES-	1627
STONYCORAL	-A-----SSPFLVLSLLNG--ILDQVIRDKILR--TR-NGSSFVAVLLNN-	1646
SEA ANEMONE	-T-----SYSSHVCISILNS--ILDQFNDRKTSR--KR-YGSVVCASIVNS-	1618
SEACUKE	-G-----T--RVMGILNG--LLDQILSNRNRQ--KR-YGMVVHSALLTH-	1625
LANCELET	-T-----AEPVWVGSILHG--LLDHLAKDKTLR--KK-EGAALCDSLLQS-	1651
STARFISH	-G-----KDVTVVSSVNLG--LLDYLTSSREVR--RT-HGMSVSAILTQ-	1657
SEA_URCHIN	-R-----EDRGTIGMIYIG--LLEHAVGNREIR--KR-YGMAYSAVLTQ-	1652

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----KVNRENSAL--LLEIQTINIV-----LNQT--K-----N	1551
TETRAHYMENA	--LPIV--NIRKEDTF--LEIELKINWLI--MSSIBGLVI--E-----K	1628
STYLNONCHIA	--VPEV--WNEQERTDF--TEFEVATSKVIYTFIANACQVQL--R-----D	1609
APHANOMYCEsa	--VLH--AT--TE--KEQP--LIMSTLLFVRSILDKS--T-----L	1509
APHANOMYCEse	--ALS--TA--AK--DQS--SLKILKQVFNFDQVK--S-----L	1468
PYTHIUM	--LKSM--IGKMADEGN--DAQTRLCLESIRQTVDFIKKCSRRMADVLDL--G	1601
PLASMOPARA	--VKQF--INKLETVKK--ETQPALSLLQILKHFVELSQNCSTVVEALRL--G	1587
BREMIA	--AKHF--VDSLDAFKA--NTQRALSLLQVLYYILELWLHCSASFIALCTI--D	1573
AEDES	--API--CDRASEIDNK--FGSTDLRLVFPMSNLA--MASPFA--LSEIG--R	1655
MIDGE	--PIT--YQISQEMDNN--LNSVDLAINLITRMA--LTSPIE--LHELG--N	1615
BOMBUS	--TIF--ESVINNLEDR--RQ--KLINILGLAVHLK--HKPIE--VS-----S	1538
ANT	--TCL--ANAVFVDSR--KE--RLNLYSVAHLK--SKPTE--AT-----	1564
WHIPWORM	--CNLK--MNLWADVSCS--SENLLKLVKLVKMLL--LINS--KIDNW--P	1610
TRICHIANELLA	--GQB--LLYVADVVS--NETLKMLKMLKMLLI--LIDS--KITEW--P	1618
BEEBLE	--DIF--EEFNE--SLS--NIQLGYLKLKFNPTI--KS--SRLQC--D	1538
BARNACLE	--QQL--ES--A--SEPALVQLGLLLLVH--LPLV--GE-----D	1541
THRIP	--DKF--IFWANA--DPC--KEAWLISLNIQIV--ELDI--DFHSV--E	1554
FLEA	--NDI--VQHVTE--SDA--VD--LVTYLGIIVPSN--VV--G-----	1553
WHITEFLY	--DII--QIYGNK--YDN--SYARMSTVLDLMLALVK--TFKNRV--GCPRS--P	1588
TICK	--VPM--ERFWE--G--T--SQDVVNGALHMLEKLV--LLAPEV--GSPRG--P	1577
TERMITE	--WNKL--SSFVEG--N--SEQVY--QLGLVVNLARIMPOPR--GLARC--E	1626
DAPHNIA	--KVL--KKHA--E--SYRQHFNLLINCLASIDIVD--G-----	1487
OSTREOCOCCUS	SHRLHL--YEDHDSATA--EMRNTVCHQRPLTIIRKVTMLDANLR--IDESI--A	1619
STENTOR	--LHEL--Q--NBEFBNHVTLLERKFMARQAFVW--KKESE--H	1441
KLEBSORMIDIUM	--LRYL--QRWT--EPE--A--SLEEKRAFIYKGLVVDGGDP--RLAQ--P	1732
CLUBMOSS	--LTEL--RPCY--LDG--S--SVTDKQFIAGIHKLLVLVDKAS--V--VGGSO--P	1561
MOSS	--LEVL--APLC--RAG--S--SLTRLRFLDILHKLMLDGTGDVV--LNIKY--S	1652
LIVERWORT	--LKCL--HPCC--ASY--A--GLADKQFPLIELQRVLLDLRSEN--LQHDQ--S	1675
LIGNANO	--WTLV--QQLW--DYG--NDDCRFSVLGILTNLAVDAELV-----K	1717
COPEPOD	--NSV--KGI--N--NSRTLLRTI--FLRLSLSKV--AEFKD--E	1561
GLOBOSUM	SFVTSI--ISFY-----Y--RTGEHSLRFWRKFLKISSVTL--AISEE--N--A	1532
PALUSTRIS	AFLTKV--VREY--N--SGNT--LQLLKKVQLDPKVL--ARTAT--S--D	1584
NEOCALLIMASTIX	DFIKSY--LSFH-----L--DKKNFYIIDFPKLPKLDNQFI--DKYAS--S--I	1660
GLOMUS	YFLKSF--VKIC-----T--YD--RHYLKLWNLFMLEPNLL--RRFSL--E--E	1715
LOBOSPOR	STLESI--VNYL-----G--RDQISMVAIWKRLVALSPRIL--R--NSKTD--T	1632
SYNCEPHALASTRUM	SFLKDL--IARW-----K--SQPKLLMAFLKGLFGADPGLL--YRTANG--H	1617
FUNCTIVORUM	--LHEL--FRSNQLMEHLS--SQSTHRENAVQARAIQI--GVV--KOSSE--H	1603
HALBUM	--LHK--SSH-----LKD--VGKTTDKENIIEFTKNLINDPTPF--FETKE--P	1760
DUPURPUREUM	--PKEI--SEWT--LNP--NLKIVEKENIVEIKNLKINPLQF--FENQO--D	1759
PVIOLACEUM	--LEKI--KQWS--LSN--NLKIVEKENIVEFTKNLIKIEPIVF--FETQO--D	1753
AMPHIPOD	--WTL--ATYG--STSDLVSNCSSTDLVSLMSLLMLVDQGRV--VAERCNAAPPA	1659
SHRIMP	--PTL--AAQA--GKTSLHQ--DSVLSLSSLFLIDREGT--IKSHCTSS--D	1642
MUDCRAB	--STY--STA--GKSSIHQ--ESVLDLSSLFLVDREGT--MKAHCSAE--D	1637
TARDIGRADE	--GSF--VEAR--PDEVKMDTVRSVLGVIKLLLSQKT--LKTGD--A	1675
HYDRA	--LKV--PEKL--ATG--IRFETQIQVLDIFILILN--VPE--G--T--L	1587
SALPINGOEA	--LHV--RTWI--NSA--GAGSETHVQRVRSVAVVRCVGRPE--TAQRH--A	1639
SPIDER	--NSV--CVWW--RDH--PDIDSI--YSVLSLMTKMLLIDSKVA--LINESN--Q	1649
LIMULUS	--GKL--NHWV--SNA--ADEDDLNNVLLLTKLLIDPAVV--TSCSL--P	1650
SCORPION	--SRL--QOCL--EES--CDI--DLQNDIITLITRMLIDSSFI--KGNV--Y	1651
ROTIFFER	--PKF--EPYV--SFE--S--QFKLMSLTKMLIESP--Q--P	1635
CLIONA	--DKN--LKPWI--NTD--E--DNDLNNLLTLRKLIMLDSVVC--TKPNH--P	1662
OCTOPOUS	--NMI--ENWW--RDD--A--SEDTQRITFDILLGILRLDSKVL--SDGQN--P	1620
CAPITELLA	--SSL--SVWV--SES--TASLDTKMVAITLLTKLMQIDSTVI--IDVKN--K	1662
LIMPET	--WKF--STWV--TNN--A--PPELQNLASLLTKVLLIDSRVT--SHTSH--P	1644
SCALLOP	--WKT--AGWC--DSK--S--SIDLQSMTLLLTKLLIDSKFV--STPSS--P	1683
LINGULA	--SQLQOQWV--APD--S--PQEVKMSALNLLRKMILINGKVV--SDPTH--P	1664
OYSTER	--WKT--SSWC--LA--T--PELHSM--AMLLTKVLLIDSKV--TDSSS--G	1653
SNAIL	--HHL--ESWV--QAG--S--SDLQGL--AVLLTKVLLIDSKAV--LNVK--S	1661
SPONGE	--QDL--SLWV--EDG--S--KDLKSAVTLQKIALKPKLL--LKSAD--D	1672
PRIAPULA	--GHL--RDWL--VAT--S--TPDRKMLMLLKRKLLIDSSVA--TKGSH--S	1672
DANTIO	--DLL--RPWV--DGP--AATPESKTSVLLAKVQLIDSSVC--SNTSH--P	1677
ESHARK	--TRL--ESWV--SEN--S--SAESKMAVLLSKVQLIDSSVS--FNVNH--E	1673
BHARK	--AKL--DSWV--SVK--S--SPESKMAVLLSKVQLIDSSVS--FGNSH--D	1672
XENOPUS	--RRL--DSWV--YKD--S--PESKMAVLLAKVQLIDSSVC--FDINH--S	1688
STERLET	--TSL--QSWV--ASS--S--SAESKMAVLLSKVQLIDSSVS--FNTSH--L	1689
GAR	--SSL--GSWV--SSP--ASTSEKMAVLLSKVQLIDSSVC--FNVNH--E	1677
HUMAN	--WKC--DSWV--AKD--S--PLETKMAVLLAKVQLIDSSVS--FNTSH--G	1666
PLATYPUS	--WKL--DTWV--AED--S--TPESKIAVLLAKVQLIDSSVS--SNTNH--A	1670
TASDEVIL	--WKL--DTWV--AKD--S--VPESKMAVLLAKVQLIDSSVS--FSINH--G	1673
COELACANTH	--WKL--SSWV--IRS--S--SPESKMAVLLSKVQLIDSSVS--FNPNH--A	1677
CAECILIAN	--WKL--DSWV--DKN--S--APESKMAVLLAKVQLIDSSVS--SNAHH--E	1679
CANARY	--EKL--DGWV--AKG--S--SAESKMAVLLAKVQLIDSSVS--FNTNH--E	1668
OSTRICH	--WKL--DSWV--AKG--S--APESKMAVLLAKVQLIDSSVS--FNTNH--E	1638
GECKO	--VHL--DWRV--TRD--S--APESKMAVLLAKVQLIDSSVS--FSTQH--E	1677
TURTLE	--WKL--DSWV--AKD--S--APESKMAVLLAKVQLIDSSVS--FNVNH--E	1677
ALLIGATOR	--MRL--DTWV--AKD--S--APESKMAVLLAKVQLIDSSVS--FNTKH--E	1635
APLYSIA	--REV--GSWV--GAD--S--SAETQGLAVLVLTRVFLIDSQPI--KEL--G--P	1685
TRICHOPLAX	--NSL--KCVW--LTP--D--AQDLLQIVNINLTKLIDPOFA--TQSDN--S	1649
SOFTCORAL	--WERL--SHWV--ENG--G--E--ELKRSAILIRNLIIVDPKCL--SEVKS--D	1666
STONYCORAL	--TSP--EIFW--RTH--S--AMDLRHSILMLKMLLIDPAKV--TDCNR--L	1687
SEA ANEMONE	--EVF--SSLW--DMS--S--SSELKQALLEIMKLLIDSPKCL--IDPAK--P	1659
SEACUKE	--GAL--ARD--K--SPDAQRAALLLKLKLLIDSKFV--MDVSH--V	1662
LANCELET	--PKL--APWV--EEG--A--LQDSKSTALTLRKLIDSKV--RDPAH--P	1692
STARFISH	--WDL--MGGL--KKG--C--STDLSQFALLMLRKLIDSKV--SDPTH--P	1698
SEA URCHIN	--WDL--SNL--GQEDDFMLNLMKRVQLIDSKV--TDPH--P	1687

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	INREYVKGLLK-----DGLNTGRSIEIHDALIIPLGLYIKHID-----	1589
TETRAHYMENA	NYSDDVVEKLIIE-----VSLKVKESLFIHQGFNLGPFYKLCI-----	1665
STYLONCCHIA	RSNHYAIIKIDHLC-----EKVSKYLKERYPVHIIKREVLNLVGMIIYLETQ-----	1655
APHANOMYCESa	PLVDCATAGNQLLC---DP-ST-----SVGVVAALQILPVLIIQA---NATE	1549
APHANOMYCESa	ALFDCALGKQVLC---DK-SK-----AASLKVDMHIIPHLKFI---SP-D	1507
PYTHIUM	PPDMDRAITVTLK---RR-EI-----SSSAGDCLSLIAGLGTALS---AE	1641
PLASMOPARA	PILDIQNACSILLK---QR-GC-----SYLVKADLLQILGLLGPSSILATKERQ	1632
BREMIA	PILDIQNAVTRLLK---ER-GC-----SYLVKANSLRLRLGLPTSVLVSSSEQ	1618
AEDDES	KAAGFERWLLPLIA---NA-QN-----SLDLKAKAMFLIPAL--VGDS---DFE	1695
MIDGE	RLENLQIWLFFNFQ---NR-NY-----SPELKSQGVFLIPCV--ASSN---DTA	1655
BOMBUS	LSKDFYMWLNQML---D--NL-----DIEKYIYLIHHLV--CLTDM---TPT	1577
ANT	QNHFYQWERDQLM---N--NN-----DLEKYIKLIRKPFV--CLTIV---TOP	1603
WHIPWORM	CASSIFRCFKLLN---DQ-SL-----CLGPFNQMLALLAFAFCCCEK---E	1649
TRICHIANELLA	EFAPMASAFMMLN---DQ-SL-----TLDPFNRMLSLILAGFCTPDR---H	1657
BEEBLE	NLKKWLLWLVLYET---NVMWRE---EPFLKIEITIDLSOILD--N--LDE	1579
BARNACLE	QAASPVAVITRLD---GD-RL-----TLEQKRPALRLITAMLRSAT---L	1580
THRIP	NVTHICSWIKLLT---DS-SR-----TLSLTDLLVCLPIVCSIS---E	1592
FLEA	PINYLAEWMLKLM---NT-TV-----SLDTKSKVLDVLPFI--TGPK---DIE	1593
WHITTEFLY	EAVGIKWMELQLG---K--DI-----DVNLKFSILOFLVALFNPQSQ---RDA	1629
TICK	HFERLFGVLLKLE---RS-GA-----TLADKVLVLDLVPV--ASDIR---PDT	1618
TERMITE	ALQK---WVITQLT---SR-DL-----QLHYKSRALDILVCL--AGPO---EDT	1663
DAPHNIA	RNSDVQWVIGCWV---Q-RT-----DVTLASDLVQLNVFIVDCSE---SEE	1528
OSTREOCOCCLUS	SNDTIVSGLMRCVY---ND-CI-----ALSSHVDIAI---ITCD--VLQ---DHR	1657
STENTOR	LIAISREFFGIEIY---K--KIPCFE---K--KIPCFE---IQ-----	1466
KLEBSORIDIUM	RAKVYVPAEAFLSQPAAPG---EN---ESEGLRVSLKREALGLPFFLGPVAD---GET	1784
CLUMBOSS	AFQFILLEVFAFLSATTLGV---WSECAMLRKKSALLNPPFFLESMD---SSL	1608
MOSS	SDFITETLSFLSCSSED---ATNSRLGSSAAPTIRTTSMRLLPFFFSANVD---SGV	1705
LIVERWORT	SRSFIQESLSCIDGAENAG---DSIDGSRDKEASITLKHVFLVPLFPKPTFG---QEF	1730
LIGNANO	SNDQVFLVGVLN---S-RV-----NFDLIVNGLALGYMCR--NP---STE	1756
COPEPOD	NTKPAVSWCNLLK---NP-SI-----ELKVYKGFQILGLMLQ--CT--D--	1599
GLOBOSUM	LSQCWFSEFLNPN---H-RS-----SLKALSDLFDLPL--VM--VA--N--	1568
PALUSTRIS	FCTVPTDAVTLLD---V-AN-----PLATITDALNLLPAPLL--VP--S--	1621
NEOCALLIMASTIX	CKDEPCKILSLE---P-SI-----NLKVKSESLDLPFFDS--LL--TNN	1699
GLOMUS	FQNLFRENEAFLD---K-QI-----DLEFKNEALDLPFFYK--SD--L-P	1753
LOBOSPOR	FVQYFFKIQSFFE---R-DP---DKREYLLPVMSEAFPILPVFLT--YP--G-Q	1676
SYNCEPHALASTRUM	TFDVFDAIRALD---R-DA-----PLSVMEAFVLPVYLT--VQ--A-E	1655
FUNCTIVORUM	GLQWMLKRMMS---R-SI-----PLSKMQLVLELPCICV--NQ--KH--	1641
HALBUM	GYDFVQLLNYLN---R-SN-----SLAFYKALVLLPDLLL--FP--KHH	1799
DPURPUREUM	CYDFVYNIITNYLN---R-SN-----PLPFYKXVLLVLLPYLLS--FP--KHH	1798
PVIOLACEUM	GYYVYSIVNYLT---R-SN-----PLSPYKXVLELVPYLLS--CH--KHL	1792
AMPHIPOD	PPCQLLEFLRTVA---DP-KT-----ELQVKITCLOLPLFCA--LN--DHV	1699
SHRIMP	-RSDMVVFNGLLA---DA-KV-----ELQAKIKVLLKLPFFFT--MG--EDI	1681
MUDCRAB	-DAGVLKFRRLR---ED-KA-----TLSMKNKALKLPFFFT--MS--KQV	1676
TARDIGRADE	EVKKLYDFISVLLTPIASD---PQ-----GAATKNRALTLAAFLD---GAN	1717
HYDRA	KDLPFLANLIEVLF---DS-KN-----SLAVKEKVISCHPHIFPK--GS--SQQ	1628
SALPINGOBECA	NFEQVLEVKRFLI---DR-AV-----DMTSKRVALQLGLPCK--GT--QHV	1679
SPIDER	FMSILPTLMTLS---KE-NN-----TMDFIYHALDILPFFCESSTS---SEN	1691
LIMULUS	YDQSLCSVLSLLT---RK-GI-----SLSPYGHVLDLAPFFKXNMT--N-K	1691
SCORPION	DSNSIFFSITLLQ---KS-EM-----SLEFKICVLDLAPFFLDAFL--C--	1691
ROTIFFER	RNEKVFQMFELT---DE-KS-----MLNFKRVLLDLPFFFT--SP--K--	1673
CLIONA	CHSTVFTITSTIS---SN-KL-----DLSFYKQVLDLSPFFLT--S--STH	1701
OCTOPUS	TCELLHKFYLLS---KK-TV-----ASSPKVSLDLPPLSV--SP--EPH	1660
CAPITELLA	SFYVFKMLGLIS---DK-NN-----TLQFKTRVLDLIPFCN--LP--AEE	1702
LIMPET	SFSTIFEMQMLV---DN-KT-----NLAFAKXVLDLAPFFAM--AQ--ETY	1684
SCALLOP	SFEDVFGTLQCLT---DT-RT-----NLAFAKXVLDLAPFFIN--VP--KPH	1723
LINGULA	SFSCVFSMSLMT---DT-KS-----SLLFKXVLDLAPFFAK--LP--EKE	1704
OYSTER	HFPEVFETLSMLT---EK-KT-----TLSVKCKILELAPFFAT--LP--EPH	1693
SNAIL	HFTTVFTSCTILA---EK-KT-----NLAFAKXVLDLAPFFAA--VP--DAK	1701
SPONGE	VSKPLVDMTAMIG---DE-KL-----ELNFKAVMIDLPSFLLSS---PEH	1713
PRIAPULA	AHRDVIDTCLLV---DA-GT-----SLAFKTRVMELEHFFYCE--LP--EQE	1712
DANTO	AFNAVFTTALLT---DV-SM-----PLNLKSOALILPFFTA--LP--SMP	1717
ESHARK	AFAMVFTITLIT---DS-TL-----ALNLKSOAILPFFAH--LP--EEN	1713
BHARK	AFAMVFTITLIT---DS-TL-----ALNLKTKAVILPFFTO--LP--EEN	1712
XENOPUS	AFAEVFTTISILT---DQ-KL-----GLNLKSOAILPFFTK--LT--GEK	1728
STERLET	AFAVFSTITLVT---DS-TL-----PLNLKSOAILPFFTN--LL--GST	1729
GAR	AFNAVFTTALLT---DS-AL-----PLNLKXNHLILPFFTN--LP--EST	1717
HUMAN	SFPEVFTTISLLA---DT-KL-----DLHLKGOAVILPFFTS--LT--GGS	1706
PLATYPUS	AFSAVFNAISLLI---DK-KL-----GLNLKGOAVILPFFTN--LT--GDR	1710
TASDEVIL	AFLDVFTTISLLD---DP-KL-----GLNLKGOAILPFFTN--LT--GER	1713
COELACANTH	AFPAVFNTITLIT---DQ-TL-----ALNLKSOAVILPFFTN--LP--EDH	1717
CAECILIAN	AFSAVFNTISILT---DQ-KL-----GLNLKSOAILPFFTN--LT--GDS	1719
CANARY	AFTAVFNTISLLT---DQ-NL-----GLNLKGOAVILPFFTN--LT--GEK	1708
OSTRICH	AFTAVFNTISLLI---DQ-NL-----GLNLKSOAILPFFTN--LT--GEK	1678
GECKO	AFSDVFNTISLLT---DQ-NL-----GLNLKSOAVILPFFTN--LV--GER	1717
TURTLE	AFSAVFNTISLLI---DR-NL-----GLNLKGOAVILPFFTN--LT--GDR	1717
ALLIGATOR	AFPAVFNTISLLV---DQ-NL-----GLNLKSOAVILPFFTN--LT--GER	1675
APLYSIA	GVESVFEMLSMLT---DC-HT-----TLAFKXVLDLAPFFVT--LK--GEQ	1725
TRICHOPLAX	SFETVFNLSLLS---GT-ST-----SLAFKXVLDLAPFFLV--SS--DKR	1689
SOFTCORAL	-SRGMFKTNGLK---DK-TI-----TLTVKIQCLELPCFATSATIP--SEQ	1707
STONYCORAL	TFPSLFEMLYLYK---DK-ST-----TLAFKXVLDLAPFFYK--ST--EYF	1727
SEA ANEMONE	AFQIVLKMITSVFD---DK-NL-----TLTFKXRAVELPFFYK--LP--DNY	1699
SEACUCIE	AFQFTTISMLT---DP-ST-----NLTFKXQALELIPFFVQ--VP--DSE	1702
LANCELET	AFQVFTMLDMLT---DS-RS-----TLFPKXVLDLAPFFTV--LP--QTQ	1732
STARFISH	VFSSVLEAFSMLT---DA-ST-----SLTFKXQVMDLIPFFTS--LP--DGE	1738
SEA URCHIN	TFRPVFNQLSMLR---DS-KK-----SLAWKXQVLDLIPFFAN--VP--EKE	1727

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----TDLPNYLNDYANKYPPKISDL-K---KGSABEELNFKTIILKKLTEMIKL-	1634
TETRAHYMENA	--NNADFF-VKGRDRDKVNSRSKYFPMKVKEL-K---RDSKQEIFDKSLGCMNMIKL-	1718
STYLONCYTHIA	--RENEFVHDKDNINFSRLTQSQFFPKITREL-V---RNSNVYNNFHIIVBGFSLLLIL-	1709
APHANOMYCESa	FG-----PPLVDVAVGHLVVHGFVHSTDV-A---RGLSDFESFELLFHTYLSMLVQ-	1596
APHANOMYCESb	CT-----EIMTEGIAHLVVHDFPVNSNDI-T---KGTVAFDAFEMLFQSYLVLVK-	1554
PYTHIUM	GI-----KQIAEVLAAVVFDEFFISSADV-H---RGRTRDEYVQQLMDKLLVVEE-	1688
PLASMOPARA	PS-----DPLNALIAVVFDEFFIVSDV-S---RGRSRDFVHMLFTEVLHVVEQ-	1679
BREMLIA	VL-----KMTLDALVEFVFDEFFIVSTDV-I---RDSKDFNTFHMLFLELLGVIER-	1665
AEDDES	-K-----ASVAEALQKIQNHFFLRSSEF-I---ANSAERVSFENCLTALLDAMVV-	1741
MIDGE	-L-----NEKLMNDLNSMOMNPLRSREF-P---EGSLARVGLVRFTEELFQALLT-	1701
BOMBUS	-K-----PEVLVILRLKNNRDLVCPNDF-S---QRNVKALKITNCFHKLVMLLPV-	1623
ANT	-D-----LQ--MNLQILKINRSLCS-DL-S---EFSVAMKVTDCFETLLVLSST-	1646
WHIPWORM	-K-----ENLESELKLFVNNFPLKSSEF-A---SEAAKPEQYIICACRCPDAPAS-	1695
TRICHIANELLA	-A-----CELGRSLKLFMNNFPLKSDEF-A---KGTAKYDQHVACQKILPAPGC-	1703
BEEBLE	-N-----TDLRRLSDCFKAKLISSETSPIP-AEERPF-----ILDKLSSLIP--	1618
BARNACLE	-S-----ANICSLERLERHFFLESSEL-A---AGSPALATYRAVLASLCEALEM-	1626
THRIP	-P-----SDVKNLSLLKQNHFFVQCSSEF-R---PGSEELATFKRAFEALLQSLVI-	1638
FLA	-N-----PELTQALKTFQSLHFFLESKEF-R---EGSITERASYMFAFALLNSLCK-	1639
WHITEFLY	-T-----Y--DNVIEPAIHAYTAALETHI-LGESSFDKNYILVKTSLNKLGLAGLE-	1676
TICK	-G-----LKLRODALEEMVAQHFPLDSSTL-L---PGAEPLYCVSAMRKMVAGLER-	1664
TERMITE	-N-----QELRSALQTLREQHFPQLSTEL-H---SGSVGYSGFVNAFRKILRGLLE-	1709
DAPHNIA	-----KTLFASLQQFFTHNFFSKSTEL-E---KSDSK-SAYFSIFNRMIGLI---	1570
OSTREOCOCCUS	VLRAQKDALEKSLGDSLKNMVMQ---ERCDAP-----TFQRRFPSTINAFKQAFAM-	1705
STENTOR	-----A---AQYLPSTQN-L---QPSKEMTDFEIMSRFFELFMR-	1499
KLEBSORMIDIUM	-R-----RRVLDSVRRIVAEHLLIQSRDL-P---QGSPOFNRYVRIKSRALVA-	1830
CLUBMOSS	-R-----TRLIGSLTSLVTSHELLVREADI-P---DGSMEERTDYLKTDLLIGAVS-	1654
MOSS	-H-----SKLIRILSGIVTDYLLVREADI-P---QGSIQRSNYTQLLNQLLAASV-	1751
LIVERWORT	-Q-----SRLCRSLTKVSDNLLVREADI-P---KGSIQRAMYTRMLSRLLAVSL-	1776
LIGNANO	-RA-----ERLSSQLKLCSETVLMRCSNQLG---INSHAYCQYVRAFRGLLQAQET-	1804
COPEPOD	-G-----NDIKDALLSFSLLHFPATSTEL-V---PNSAAYNLYMSVFRQLLRTLES-	1645
GLOBOSUM	KF-----QKLEESLSSIVVEKFFLVSELT-E---DSNEQMDNYVCMNKLLEAMARC-	1616
PALUSTRIS	NA-----AKLERRLDIVVQFPISPDKL-V---EGTAQYSDYVDMANSLMKALEL-	1668
NEOCALLIMASTIX	YK-----DQLEKSEIEFLIYNQFPISNDI-I---KETLQYIEYKNTVTAFIN--LLS-	1745
GLOMUS	K-----EKIESCIEFLYQQLPTDSKDYSK---FGTKKLINEYSLVDKMFAMVR-	1800
LOBOSPOR	RT-----VEFESVFNRAVLNLMFMSSTEY-E---RGSSKFKDYINALDLLKALVA-	1723
SYNCEPHALASTRUM	HV-----DRTIALVKEFASWQLGRSRDL-R---VGSSEYNYIAMLDKIIEHMSV-	1702
FUNCTIVORUM	-R-----EGAKEMLLDMVYDFPVSKEL-P---VGSAAVYDYSIALDKILSSLEI-	1697
HALBUM	NY-----NLIQEKLENIIVYDFPLSSKDL-T---KGSPIYNEYITPTIERPLNTEI-	1846
DUPURPURIUM	NF-----SLIKEKLENIIVYDFPLSSKDL-T---VKSPYIYNEYVTCIERLLETLEI-	1845
PVIOLACIUM	DY-----SIIKEKLENIIVYDFPLSSKDL-T---QRSPYIYNEYVTIERPLETLEI-	1839
AMPHIPOD	-Q-----QKVVEALEFFSVHHMPLKSDEF-A---AGSARDRDVRRCLKQLLTAVEL-	1745
SHRIMP	-A-----KSVSEALEMLSLNHFFLHSTEF-S---EGGARDREYHQAICEILTALEL-	1727
MUDCRAB	-S-----KSIDSELMVSKHFPMSSEF-P---VGGSRDRDYHQAISEILTALEL-	1722
TARDIGRADE	-G-----AVAETAMHEMVCVNDFFLKAEL-P---KGSPLAFYLAQVGFVLAAVEE-	1763
HYDRA	-C-----ADFKVALEHVAVNDFFVNSDEL-Q---IRSLKYAEYTSCLQSPFLRVLVN-	1674
SALPINGOBECA	-R-----TECAASLNAPQASFPVRSREY-A---VDSQTHREYIAALDILDALVL-	1725
SPIDER	-S-----TNLRSHLEEMVNHFFLQSTEF-V---PGSSAYHTYISALKNMLSALEL-	1737
LIMULUS	-E-----VLRNALDELANTFFLQSTEF-V---VGLSRVNSYVTFVRKILTALEL-	1737
SCORPION	-----KVQNALDELANTFFLQSTEF-K---PGSSQYNDYHAFKLLTALEL-	1735
ROTIFFER	-----FKVNSLQPM-SQLPRLSQDL-A---KSDIYKYDILAVHKKLLVCELE-	1715
CLIONA	-S-----EIKETLTKFVSNHFFLRSSEF-V---AGSEKYNYSITAMRKLDCMEL-	1747
OCTOPUS	-N-----SRLRNLKXFLMDK-----S-Q---PGTLTYDYISLIDKLLPALKK-	1699
CAPITELLA	-N-----KQLESCLNQFVADCFMSSLEF-H---AGSQQYKQYITALDRLLAMEL-	1748
LIMPET	-I-----TKLKSLLDRFVADNFFIKSNEF-T---KGSPRQDYISAINKILLALEL-	1730
SCALLOP	-V-----TKLKTSLDRFVADNFFLKSSEF-P---KGSQYRDYITALDKILSGLEL-	1769
LINGULA	-T-----QQLKACLDRFVADHFFLRSSEY-A---VGSQPKQYEMALSKILLSALEL-	1750
OYSTER	-L-----KKLKRSLDRFVADHFFIKSTDL-P---ESSPHFKDYIAAIDRLLTSLEL-	1739
SNAIL	-L-----KDVLDGLVADNFFLRSSEL-T---KGTFRPVDFYISADIKLLSALEL-	1744
SPONGE	-Q-----SQLKGSILNRLVSLQFPLTSSSEL-P---AGGPLLINEYTNIEKLCNSLVA-	1759
PRIAPULA	-T-----TKLRENDRMVAADFFPLRSDDF-I---VGSPKYHYDVAAMSQLLDVMV-	1758
DANTIO	-L-----EELRRALESVATHFFMOSDEF-P---RGSQCNNYMDCKRFFLEALQL-	1763
ESHARK	-L-----AVLRHALDQFVAHFPMKSDEF-P---KTLKRYNNYVDCIKKFLDALEL-	1759
BSHARK	-L-----VTLKNALNHFIASHFPMKSDEF-P---KGLTRVNNYVDCIKKFLDALEL-	1758
XENOPUS	-L-----TELKNTLDQFVASHFPMKSDEF-P---KGLKPNYVDCIKKFLDALEL-	1774
STERLET	-L-----ADLHNALEVLVASHFPMOSDEF-P---KGLTRVNNYVDCIKKFLDALEL-	1775
GAR	-L-----AELQRALEMVASHFPISSDEF-P---KGLTRVNNYVDCIKKFLDALEL-	1763
HUMAN	-L-----EELRVLEQLVAHFPMOSREF-P---PGTFRPNYVDCMKKFLDALEL-	1752
PLATYPUS	-L-----NDLKNALQFVAFNFPMSDEF-P---KGLTRVNNYVDCIKKFLDALEL-	1756
TASDEVIL	-L-----EDLKLALEKLVASNFPMSTSEF-V---QGLTKYNNYVDCIKKFLDALEL-	1759
COELACANTH	-L-----ADLKNALDQFVAFNFPMSDEF-P---KGLTKYNNYVDCIKKFLDALEL-	1763
CAECILIAN	-L-----NDLKNALDQFVAFNFPMSDEF-P---KGLTKYNNYVDCIKKFLDALEL-	1765
CANARY	-L-----NDLKNALDQFVAFNFPMSDEF-P---KGLTKHNNYVDCIKKFLDALEL-	1754
OSTRICH	-L-----NDLKNALDQFVAFNFPMSDEF-P---KGLTKHNNYVDCIKKFLDALEL-	1724
GECKO	-L-----VDLKNVLDQFVAFNFPMSDEF-P---KGLTRVNNYVDCIKKFLDALEL-	1763
TURTLE	-I-----SELKNALDQFVAFNFPMSDEF-P---KGLTRVNNYVDCIKKFLDALEL-	1763
ALLIGATOR	-L-----KELKDALDQFVAFNFPMSDEF-P---KGLTRVNNYVDCIKKFLDALEL-	1721
APLYSIA	-S-----SKVIDGLNRFIADNFFLKGNEF-S---KGTGHNNYVDCIKKFLVAMEM-	1771
TRICHOPLAX	-I-----RELREHLDRMIVDKFPLKSAEF-V---VGSQYNDYVACIKKLLANLIK-	1735
SOFTCORAL	-T-----EALRSALKTLIADNFFLKSSEF-N---ENNPYSDYIAALDKILLSALVI-	1753
STONYCORAL	-L-----RRLKEGLNAFVNNIPLKSSEF-V---TGGPQYNDYVQITDKLLAAFVN-	1773
SEA ANEMONE	-Q-----SQLKSCIDTLVTDNFFLKSSEF-I---PGSPRYNDYIATLDKLLVMTV-	1745
SEACUCU	-S-----QKVREALDQFVVDNFFLKSSEF-G---VGSQYNDYIAALNKLLTAMVL-	1748
LANCELET	-L-----AELKARLDRMVAADNFFLKSSEF-P---AGSSQYNDYVAGVTKLLSALEL-	1778
STARFISH	-Q-----TKLRSALDRMVAADNFFLKSSEF-R---VGSQYNDYIAGALNKLLTAMVL-	1784
SEA_URCHIN	-E-----KELKSALDQFVAFNFPMSDEF-E---AGSPRYNDYIAMNKLLTSLVM-	1773

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	CG-----QIQYIEVLPFLLRQDL-NPD-----LFIQEFLQI-----	1664
TETRAHYMENA	AG-----QIRLELILFPVIRESL-EEPVHTKIIITPQQIKFNKEMTQ-----	1759
STYLONCHIA	SK-----NLKVLRLMIYNSMREWK-T-TYEPKLRKTLKIQESINKM-----	1749
APHANOMYCESa	SG-----HVGLLKTFRSLNEKN-QHVFSNDMYDMLTQCDDLDGPR-----	1637
APHANOMYCESb	SS-----QIVLLKTLFQSLKEKK-SHAFYSAIQDALESFALEVPMCR-----	1595
PYTHIUM	CR-----SVLELKVLYSSLKEGS-KHLFGKTIQSSGLRGLATNVTGS-----SGPRF	1733
PLASMOPIRA	SK-----SIAYLVKVIYPSLKEAE-SHLFRVEIKQMLARFCITLGSGLQIESTVHADN	1730
BREMIA	SK-----SVAYLKIIYPSLKEAE-KHVFPYTEIKQMLARFCITLGSGLQIESTVHADN	1716
AEDDES	SR-----SPVLLKAVIADTAADP-EHIAEHKIRIALEKYMSSQNSN-----	1781
MIDGE	SR-----SPAVYRFITINITISDD-AYIMESKLRQVQVNI MERLSST-----	1741
BOMBUS	TK-----SVIVPEFTLFAFGL-AKYLNETNETNEYLQKYFDSITPD-----	1663
ANT	TK-----SMLKCYTFEAGA-CNRLINKELEHRLQFYCASLE-----	1686
WHIPWORM	TG-----SLVINLLLAVVCCRE-QHPVSYLHSSPHYVQSVRFA-----	1735
TRICHINELLA	TG-----SPILLELLSMVCREQ-SHPIASDLKHQLQKFPSSRANSa-----	1743
BEEFLE	KL-----RCFLLVFLLEIYAKMSTGNSISDVKHMYMTEIMNNOQE-----	1659
BARNACLE	TA-----HPALARYMCLVLCRE-ARHPCSGLLAALTAAGRHGTA-----	1666
THRIP	TG-----SSSILNIVIRMTVDP-NHNCRHLLPSTLQKYMAVLOKSO-----	1679
FLICA	SQ-----SPILLERITISIAADL-DHICEDEIQEKLCAPIENCAPE-----	1679
WHITEFLY	TG-----NAFLKRIIMRTSIDLQ-NIRNDIKKTLANLTKKKNDI-----	1716
TICK	SG-----SLVLELLRVLRYREGSHFLAEVLAQRTLTRCGET-----	1705
TERMITE	SG-----SCVILLSVAMA-ASESQHVLEDIQKSLQIPIKRLEDK-----	1749
DAPHNIA	-C-----VPVVHFVLDVFALEP-NHPCLPEPFIQSVQNEWTESIG-----	1610
OSTREOCOCCLUS	CR-----SFRLISALVPFYDK-----WLEPCVKGAVTSW-----	1734
STENTOR	TP-----TLANLEL-LHLLIRER-KSLYBEKLNQITMVLKIVKVBAG-----	1739
KEBSORMIDIUM	SL-----SLGLEEFPVLQFOQC-NPLASRRLEHRLPAGETARKD-----	1871
CLUBMOSS	SR-----NLDALEVLPFLQNP-TGLTTPPLSEALRAYAQNIIG-DK-----	1693
MOSS	SH-----SLELELVIFPLVQTP-NKISSRAVSEAVEVFAESLE-DN-----	1790
LIVERWORT	SC-----SVTLELILFPLLLDP-PKFAVRTLFDLSLELSONIG-EE-----	1815
LIGNANO	SE-----HPLLLEILSILVCKER-QHALEAEFQOCLNRLLRIPQIR-----	1845
COPEPOD	TK-----SPTLLYFIIISACREP-CHVCEDDIQSTLSNLSRSSSDQ-----	1686
GLOBOSUM	SN-----SAMVERILMLHMCRRP-SHPFNESVMDCSIAKASSVSFEV-----	1657
PALUSTRIS	SD-----GVVIPKVLARHVCRE-SHMFVAVSLKAMGAIARRLSAAD-----	1709
NEOCALLIMASTIX	TG-----NFIIKKNLLLTCKEE-NPKYQEKIKEFAIILINNYSEEQ-----	1786
GLIOMUS	SR-----SVSLFKILPTFCRES-DHMYGEEFQVQVSEFLSKLSRSK-----	1841
LOBOSPOR	SS-----SFSLFKTLMGIAIRES-NHPHMEQQHISSEFALRQPLSK-----	1764
SYMPHYALASTRUM	FR-----STPLFNLLPLYIQEE-DHIHAEAFKGGFAKARTLDMKR-----	1743
FUNGIIVORUM	SI-----SDRQGLVTSMPLEALPALSE-M-NHSIFQSMVSITEKATSCOSS-----	1735
HALBUM	TC-----NPMIDTLLQVLKE-Q-DHSHIQTINQSIERTIVRTNDSQ-----	1886
DURIPUREUM	TK-----NPIIIDILLHVLKE-T-DHSHVHYINLSIERTILLTNDSE-----	1885
PVOLIACEUM	TK-----NPFMIDVLLHVLKE-T-DHSHIQINLSIQKILISTNDQO-----	1879
AMPHIPOD	TA-----RPVLLHLAKIFCHES-NHRYKDLLESMSKVMAGVGTAE-----	1786
SHRIMP	SL-----SPILLQFVVNLFCRE-DHRYEEVMEHESLEKFMKLLPLK-----	1768
MUDCRAB	SL-----SLELLKFLQVFCNED-KHRYEEAFNESIEKFKRQQVSK-----	1763
TARDIGRADE	CR-----SIGGTEICIKLVCRA-DHPLLEERCGRMFEAVVANDHSEN-----	1804
HYDRA	SS-----SPLLEVLVSVFVRE-KSVYKRVLPALQPAKILKVN-----	1715
SALPINGOBECA	SG-----SLELEVVVTVHQREDRTHVHEDHQRKLRDPVQEHDTA-----	1767
SPIDER	TG-----CGFLFEILTSPFCCKE-EHVLEVNFQCITDMLSKSSSH-----	1778
LIMULUS	CG-----SLTLTFVVMGIMCREA-CHLLEEEFQRIISRSVCRKLPKE-----	1778
SCORPION	TC-----NBMLLKQVIMCREB-THLLEHQCKLKLCKRTDSSK-----	1776
ROTIFFER	SQ-----NLDMSLIGVVCREK-EHLCENQFRCLEAKKLSSEK-----	1756
CIONA	SG-----SLELLNWNLYCRDQ-SHVMSDEIMSSLEKCVASIPVSK-----	1788
OCTOPUS	SK-----SKMLLELVIEYQCEE-KHCHEKDHNCLTEFKRRSLD-----	1740
CAPITELLA	SG-----SLMLLNLIISVICKEV-KHTEHAIQSAFORIKRILPKDK-----	1789
LIMPET	SG-----CSMLLELLISIFCRES-KHVEDEIDQVIRARYTKRLVIYK-----	1771
SCALLOP	SG-----SLVLELLISITCREQ-KHTYEDTIQQFLNRFTRRLPADK-----	1810
LINGULA	SG-----SLMLLELLISIMCREK-NHVYEDRMQESLVTFIRRLPTGH-----	1791
OYSTER	SG-----SEMMLLELLISIFCREP-KHVYETKILESINRFRTRVPAK-----	1780
SNAIL	SS-----SLVLELLISIFCREEGRHVEDAIQOQLNTFTARLPAEK-----	1786
SPONGE	SG-----SLVLELLISINMCREV-RHVCEKIQTSLHQIFSKLSEGD-----	1800
PRIAPULA	SG-----STMLLRLVTSIVCRE-SKAMHDQLQTSLSRPIHRLSADK-----	1799
DANTIO	SQ-----SPLLKLMARVLCRDK-KHIMEELFQACFKIAHQSYLKG-----	1804
ESHARK	SQ-----SPMLKMLMALLCRDS-RHVMEEGFQVCFQRLAKGSCCK-----	1800
BSHARK	SQ-----SPMLLQIIEVLCRDN-RHVMEEAFOICPONAKRGTCCK-----	1799
XENOPUS	SQ-----SPMLLQIMEIILCRDE-RHFMEELFQSSFKVIRKSSCDT-----	1815
STERLET	SQ-----SPMLLKLMEIILCRDN-KHVMEELFQCFKRIARRGSCCK-----	1816
GAR	SQ-----NPMMLKLMEIILCRDK-KHVTEELFQACFKRIARRGSCER-----	1804
HUMAN	SQ-----SPMLLELMIEVLCREQ-QHVMEELFQSSFRRIARRGSCVT-----	1793
PLATYPUS	SQ-----SPMLLQIMEIILCRDQ-RHFMEELFQMSFKRIARRSGSAK-----	1797
TASDEVIL	SQ-----SPMLLQIMEIILCRDQ-RHVEIEELFTQTFQRISKSSSAT-----	1800
COELACANTH	SQ-----SPMLLRMLMEIILCRDS-KHCEELFLRCFKVIRRGSCDR-----	1804
CAECILIAN	SQ-----STMLLKLMEIILCRDT-KHFMEELFQSSFKRIARRGNCK-----	1806
CANARY	SQ-----SPMLLQIMEIILCRDN-RHFMEDLFQASFKRISRRSPDK-----	1795
OSTRICH	SQ-----SPMLLQIMEVLCRDH-RHFMGLFQASFKRISRRSNSDR-----	1765
GECKO	SQ-----SPMLLQIMEIILCRDH-RHMEGLFQFESIRIARRGSCYK-----	1804
TURTLE	SQ-----SPMLLQIMEIILCRDH-RHMEGLFQFSFKRISRRSSEK-----	1804
ALLIGATOR	SQ-----SPMLLQIMEIILCRDH-RHCMEDLPQFSFKRIVKRSDCNK-----	1762
APLYSIA	TG-----SAQLLETVISVFCREK-RHPHEDIQAGIARVQRLTPDG-----	1812
TRICHOPLAX	SG-----NLMLLEVLISVMCREK-KHAYEIQKSLLLLFISSLIPKD-----	1776
SOFTCORAL	SG-----SLMLFDLLISIVCREE-SHSHHEEIQFQAKFKRKLKLOQ-----	1794
STONYCORAL	SR-----SLILLLEVLIAIFCREK-QHVHEDTIQQSFIQIARLHPPE-----	1814
SEA ANEMONIE	SG-----SLVLLQVIAVLCCREE-RHVHEEIQKSLAAFIQRLAPSS-----	1786
SEACUCLE	SG-----SMNLELIVIGLCREE-KHYEAEIKRSLSEIRRMDSK-----	1789
LANCELET	SS-----SLMLLELLISVMCREA-KHYMEDDIQTSLSRPIKMGADK-----	1819
STARFISH	SG-----NLMLLELIVISIMCREK-KHAYEIQESLAAFIKRPLEEK-----	1825
SEA URCHIN	SG-----SLMLLELISILCRDD-KHSYEDKIQALSSFAKRLPSEK-----	1814

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

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PARAMECIUM --NQESYQQLKQWMLQIKDEQLDSTLNNAVIALGNKLLIPL--LSNS-----NLL 1711
TETRAHYMENA TVNKQLYFMWALDQYKDKDLDRSLLECIRVEIIQKVLHLH--LENA----K----EBAN 1809
STYLONCHEIA PLHQFKOTFSQFQDEFMNRQIDLSVDDNLKWAIMKKTILKLI--LESC--S-----QEFL 1799
APHANOMYCEsa IPSVCLVELPLV-----FS---PSLTDHIRTLLRQVFPVL--MTRL--D-----EAAI 1679
APHANOMYCEsa IYPICVLLELQLL-----FD---FGLDDYIRTVLRQVFSRL--VHQL---E-----EAAI 1637
PYTHIUM AHDYMMLELLEVL-----LD---PVGDLTVRMMLENLFPVPL--AELQ---K-----ADNL 1775
PLASMOPARA IQRQMAELLDLL-----LD---PNVDVAIRKILILEVFTFPL--VECQ---T-----GEIL 1772
BREMIJA MRLLQLAELLEVL-----LD---STLDVSRVRLLEEVFTPL--LECQ---T-----GEVM 1758
AEDESA ---QOCFNLIKQIFTK--FRE--ESLEPNIRLTLKRYLVTSL--LRVC--N-----VETI 1824
MIDGE ---EQEVIMMOTFDE--FST--NKCEPEIRLKFSRFLITL--MKNS---H-----NVMV 1784
BOMBUS ---YAVKSLQAAKIKLFHM--L-----TNERFDVLQRFLPLPS--FEFC---D-----TTBI 1703
ANT ---HVLESQITVDAFME--T-----NTSPTERLILRFLPA--EKFC--N-----ALAI 1730
WHIPWORM ---SVNAADKLYSTFDLDA--SCPTEDYKSSVFPFLPL--LOCM---D-----SAAL 1780
TRICHINELLA ---VLENILELLEKDMFPNPS--GCVCASLRALLNEFFIPL--LSL---K-----NDLL 1788
BEEFLE ---HKLILLV--KLYDLCLLED---LDNFQKYKLI--IDTSSV--FOYC---N-----VTSF 1700
BARNACLE ---QQLALAEELAL--FWPA--GGLPAAGRRLLVSLCPL--LRAA---D-----RPVL 1710
THRIP ---DHQVESLKVFSM--FEN--ETISVEYRAKILINELKLI--MFA---S-----LSSQ 1723
FLEA ---NQFNLRIPYFQ--IKS--REYTPSIRVSLKRVLGTI--LTSC---D-----QQII 1722
WHITELY TICK ---IKKDLNVMPFC--AVG--LPELENYRENILKYLVEPT--LRYCCIKSG---KNVL 1763
TERMITE ---KQQQLTEAALLTNQSTN--QGLLISARLKSASKLPLL--LKSC---S-----KPAL 1750
DAFPHNIA ---QVKAIEAVFKV--FVD--DOYDPVSRGLCAQRFVRLP--LOGC---R-----RSAA 1792
OSTREOCOCCLUS ---TSLDKVNRIYVHAKT-----RSINWKTREFAIETLYTSL--LKAL---P-----S-- 1651
STENTOR ---NGALQSSILWLIVAD-----VYADFRQLSAAASLILPFL--LEAA--N-----AQEI 1776
KLEBSORMIDIUM ---YETTFQLTEMLVDQPNMDEKGLIDMRWGAKRILPLM--IDYA---D-----ELMI 595
CLUBMOSS ---FKPLETELTLHD-----GKQPRLLKAWDMVWPA--EYAA---D-----ESFI 1913
MOSS ---RVAARSYCDMVLKD-----ATKLPRLKAVLDYFVPL--ICLS---P-----VDPL 1735
LIVERWORT ---REAAFNLCITMIMD---RGKSYELRRAVVEVIFEAP--VNSS---S-----MEFV 1832
LIGNANO ---RTACNLNLCQLLGD-----STKLPOLRRAVIRDRVVSLL--MNA--S-----PLFV 1857
COPEPOD ---CRDFWTPWRFLFRGDSGGGTFGPHRQLVSRVLA--LITC---H-----GSVL 1891
GLOBOSUM ---QFELITVPYTFIDDS--GLFSAQVRLSIVRFAVPS--VOTS---L-----PATI 1730
PALUSTRIS ---FDELEKYGFEFSVQ--S---KNSHDLRWNAKLLLVT--LQSC---Q-----LDNL 1699
NEOCALLIMASTIX ---IDMLSTLGLFFPD--S---SLPMEVRGNVHMLVLA--LSVA---P-----KAVV 1751
GLOMUS ---FNEFTDYCMEVLLN--N---KALPLVKNVIRQYLIPA--LIHV---N-----CQFK 1828
LOBOSPOR ---YVDTMDIAYGYFTN--S---T--YVSFRRIIEMILSPP--LQO---P-----KIFV 1882
SYNCEPHALASTRUM ---VLEITGYCFDEFIK--R---THSDEHRRRIHQILLPM--LKAL---P-----TFSV 1806
FUNGIIVORUM ---PHLETEFCLAYKQD--D---GNRLEVRRNVI--SLLVSL--FVLV---P-----DDV 1784
HALBUM ---ACQLFASCSHFIM--E---SLQQLRHLHDOLFCPL--EKRI---D-----HLSLNGESHV 1782
DUPURPUREUM ---AKEIFSHCFELFLN--H---NDELKITLIDKFCVPL--LSHM---K-----EETL 1928
PVIOLACEUM ---AKDLRSHCFQLS--Q---DYQDELKITLIDKFCVPL--LHHM---K-----ETVL 1921
AMPHIPOD ---QFSLASRVQVVEAQE--ASGLQLHRQLNERNVLSL--LRTA---D-----VVS 1830
SHRIMP ---QOETLKHIDMYNDPT--CIKQ--NLRYNIMDLVLTPL--LQA---E-----AVPT 1811
MUDCRAB ---QIDTFRVYDMYANQS--HLKQ--NLRYNIMEKVLTL--LQLS---D-----LTVT 1806
TARDIGRADE ---VQKIFEPKWFITP--P---QYQPDHRRATAVEILLPM--LOAA---T-----STAR 1846
HYDRA ---VDIVLDSLVMKFNDE--E--SKYADDIRAVIIDRVCIPL--LINEV--S-----WISL 1758
SALPINGOEA ---PQALELMPQIYLA--E--T--NPLFVRRGVAQRVLATP--LOAC---K-----LSMC 1808
SPIDER ---HQLYADIVFSLIMKSG--FDSKSDVLLKIVNKLVLV--MONI---S-----LTSF 1822
LIMULUS ---QVNSMDTLFGMFLCED--Q--LPAEMKLGITIEKVCVPI--LRL---S-----KPM 1821
SCORPION ---ERLLEAVPLKMFLEDE--L--VPSDMRHHLEKVFVPL--LQMI---S-----KITL 1819
ROTIFFER ---QMEIYKQWSNFSQS-----SDDERKFLIEKVIPL--LKNC--D-----KPFV 1796
CIONA ---QCPALEIPYTFITP--S---TQRSIPAAQTALHNHVNPM--AACC---D-----NVSV 1830
OCTOPUS ---QKSYQVPPDFLFLK--T--QSCVNNPKKFKVKKVCLPP--LRNM---S-----KIPF 1783
CAPITELLA ---HKLALDVPYKIFSQ--E--GRFTNNQRRAACEKVSLSL--LRLV---H-----SSAL 1832
LIMPET ---QKLALDIPYKIFTYS--S--GSYPSAIRIAALSRLVPLM--LRLV---H-----KSAV 1814
SCALLOP ---QKLADVAVGVFSK--E---SYPAEIRIATLHKVALPM--LHLC---H-----KSAL 1852
LINGULA ---QKALDVPFNIFTK--E--GLFPEIRRSRLSRVCVPL--LRLC---H-----QSSL 1834
OYSTER ---QKSMVDVYVYFCQ--E--KLYPGEVRRRTIIEKVALPI--LRLV---H-----KSAL 1823
SNAIL ---QKDALDVPYKIVFC--E--SGFQDMIRRTTLERVCLPI--LRCV---H-----KAAL 1829
SPONGE ---VDALKFVYEMFRN--D--KDFPVAAVKGGIGERLCPVL--FTEC---S-----SAVL 1842
PRIAPULA ---QKLAADSGYSILAE--E--GNPFGETRRSCLDMVVLVLL--LRQC---C-----HHA 1842
DANTO ---QVLLSSTQSFFQA--K--EVPSPNFMLMGLDRVLTPL--ASHC---S-----PQAL 1847
ESHARK ---QVALLEAVGVMEFN--E--AGLSNLRASQVDRSLLTL--THLC---S-----LDAL 1843
BSHARK ---QVALLEAAVEMFRN--E--EMLDNATQFAMDRLTLL--LGHC---S-----PDAL 1842
XENOPUS ---QVILLNPTLHNMFKS--E--SLMLNGTQLSLDRCLLTL--LWNC---S-----LDAM 1858
STERLET ---QVSLDTPVYQMFQN--D--ELHSNTARQAVLDRSLLTL--TLHC---S-----SDAL 1859
GAR ---QVVLLETVYEMFQA--G--ELASGAMRQAVLDRVLTPL--VLHC---S-----SDAL 1847
HUMAN ---QVGLLESVYEMFRK--D--DPRLSFTQSFVDRSLLTL--LWHC---S-----LDAL 1836
PLATYPUS ---QVALLEAVHGMFLR--D--DHLSSSTRQAFVDRSLLTL--LLHC---S-----LDAL 1840
TASDEVIL ---QVALDTPVHRMFQK--D--D--LNSIPLRACVDRSLLTL--LWHC---S-----LAAL 1842
COELACANTH ---QVTLDDTVYKMFQD--E--GLLSNTRQAIMDRFLLTL--MLNC---S-----IDAL 1847
CAECILIAN ---QVALLETVMDFMFKT--E--NLWSNTRQOTIVDKSLLTL--LWHC---S-----LDAL 1849
CANARY ---QVLLDTPVHKMFQS--E--ELLSNAARQAFVDRSLLTL--LWHC---S-----LDAL 1838
OSTRICH ---QVLLDTPVHKMFQS--E--DLRSNVTRQAFVDRSLLTL--LLHC---S-----LDAL 1808
GECKO ---QVLLDTPVHKMFQS--E--TLSSATRQAFVDRSLLTL--LLHC---S-----TDAL 1847
TURTLE ---QVLLDTPVHKMFQS--E--ALLSNARQAFVDRSLLTL--LLHC---S-----LDAL 1847
ALLIGATOR ---QVLLDTPVYKMFQS--E--SLLSNVTRQAFVDRSLLTL--LWNC---S-----LDAL 1805
APLYSIA ---LATALNVVYVAFSK--E--QSYFHEIRWAVERLCPM--LHLS---P-----RVTV 1855
TRICHOPLAX ---ALGALDVPFKMFDV--D--KSYRPNIRRAAIEKVCVPLM--LOKA---S-----LKIT 1819
SOFTCORAL ---ARKALDICFDVFTKKD--TEYRNLTRRAAIDKVLVL--LRAS---S-----TSVF 1838
STONYCORAL ---DQAKAAMDVCLSIFFN--E--RDYQTHSRRAVERICITIT--LLKT---S-----TTAR 1859
SEA ANEMONE ---SLVKGADVTVYRIFTN--E--RDHTSNVRKAVLDRVSVTL--LCNA---S-----KAGV 1831
SEACUCU ---QVSALGTCLKIFQA--E--GEYFTQMRRAVMEKVCVPLM--FRLC---Q-----VDSV 1832
LANCELET ---QKPALEDIPYGIFFR--E--GSFPNEIRRALERVCLPM--LRLV---H-----PAAL 1862
STARFISH ---QTAAGVAVYQIFCQ--D--NSFSKEIRRAAIEKVCVPLM--MRLA---G-----VKAL 1868
SEA URCHIN ---QSAANIPPEIFQK--D--KRYSKEIRRAAIEKVCVPLM--LRQA---S-----RDAT 1857

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Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	LEFYSEPTPY-----LIQ-QL-NV-TWDDN-WKN--MLFQLQW---RGLIFDLPGIA	1754
TETRAHYMENA	VKFMVKNSPY-----LKK-LF-YN-TDFMK-QEN--MKEVLRWQELQVFNIPESL	1855
STYLONCYTHIA	ADLMEPTPQ-----LII-VL-KE-SIFLQ-KDP--LE-QYQLKQKRWIFLVPEVM	1844
APHANOMYCESa	VAVVSTTSFG--APVVQYLMT-VV-----TS----DTSPLAVVVVTGLLELL	1678
APHANOMYCESa	IKLFTMTSFG--VPFVKYLMN-IV-----LN----DQSPILSLVMAFGSLELL	1720
PYTHIUM	REFYMLLEDKTSKVTMISKLAT-VV-----SNSSDVAQOGASTAAVAYTLVELL	1823
PLASMOPARA	LHFYMMENEKRRKSTIISLLAT-LI-----SASABGAFESRIGTVVAFSLVEIL	1820
BREMIA	LQFYLMEIPKRLSVISVLTAT-LI-----SASADVQSRGCGIGVVVAYSLVDIL	1806
AEDDES	YTFYKLYIRN-----IND-MI-R-SNYG--QFGSGWEAEHAVNRLGGYQLIELY	1869
MIDGE	KSPFIRQKML-----IWS-LI-E-A-----PLNVDMENGFVNRKAGYMIIEAF	1824
BOMBUS	NKFFETNIEK-----IYT-VI-C-QSLV--GG--TSDIKQIVSKIGCYDLVAIM	1746
ANT	ERFVKKILL-----LKK-MM-T-KNID--CN--DAAIKOIVSKIGCFQIAIM	1773
WHIPWORM	GHEACSHVSS-----IYS-TL-S-ETDL--NPI-HQLYEKQIVPKQGYNICSLL	1824
TRICHIANELLA	ITLCKRKIQT-----LVS-CL-T-ESLT--LEI-QTDCEQOILPKIGCYKICAI	1832
BEEBLE	EDFTEPITST-----VLT-VL-K-EP-----VTTENLKNKILHFLLVGLV	1737
BARNACLE	LQFYTSHVVA-----IAR-PV-QDEPPA--VPADSEPTHEQVSRMSGFSLLEVL	1757
THRIP	VSVSVSTISK-----LVK-RI-T-EGFS--MKTVDGKQKHKLMSHIGSQWLLQHI	1768
FLA	ELFYKNFFEE-----VFNLI-E-SPYT--SASRAWDLQKAVDRTCFHLITIL	1768
WHITEFLY	KVFEQCIEN-----LMT-TV-N-AEFT--LSAKENEINTEVSKIVALTLLEIL	1808
TICK	HRFFVDNVT-----MVD-AV-A-AKIR-----HGSESELSKIVALSCLEVL	1790
TERMITE	REFYRHCIQD-----LIG-ML-N-VTLD--CRG-QLQTEHQLVGRIGAWNILEPL	1836
DAPHNIA	--SFERHVNE-----LIG-DITQ--ICEE--ARGGVEAFVHKIVVICALFEVA	1692
OSTREOCOCCUS	VEFMEHNET-----IMK-DI-T--GG-----ANGLLCTLRSLANVLLSV	1810
STENFOR	EKMLYCTQO-----MLG-KITE--IKPT--EYDSKBLFRERKRWILLIEPFP	1631
KLEBSORMIDIUM	SEWADKFE-----LKR-TL-G-KEYSY-RTRTDAETFOELTTRTALSLIEM	1960
CLUBMOSS	TGNFTPRVTE-----LMD-SL-G-RTVM--SPDMTEQOELLAKIYSYTLLELL	1779
MOSS	TVWYQHSID-----LFY-VL-K-QSSS--MLSAEREFEDLKKICHYELLELL	1876
LIVERWORT	ADWYSKRIK-----IVD-AL-G-KPVN--SIDAETEEELVWVKVCHSLELL	1901
LIGNANO	LDVATDDCLE-YC-----LIC-LL-N-AQOSLAGFN--ESETEEILLARGCCRVLSCF	1940
COPEPOD	RRFFSEMES-----LLL-NV-G-VEVL--GS--EKRASVLSKIGTFQLFGLV	1773
GLOBOSUM	VRFFVQYIRE-----IMD-NL-A-AAAPT-GD--ESALLQYLVTKAICFMLEVA	1743
PALUSTRIS	RAAFVRHIQ-----IMT-TL-S-RPLST-K---EHDQESQLLTKTACFELMDCV	1794
NEOCALLIMASTIX	IKFYSKHIS-----LTK-VI-K-EQLIN-K---EDELICQLNIHSSIFNLIQIM	1871
GLOMUS	MDFFKKHINE-----IID-LL-E-RDKYT-RNV--DEKII-YNERAGSLTLQLL	1926
LOBOSPOR	SEFYVLIAR-----IM--GV-I-KQETP-RST--DTEMRRDYIERECCYGLVHV	1850
SYNCEPHALASTRUM	VDFYLDNILF-----IMT-GA-T-RQLLR-RGT--DEEIRVDMEKTCCTYLMQTF	1829
FUNGIIVORUM	QGLAERIST-----IIG-TL-N-HTIN--FSODEEFTKTMFK---KISYIA	1822
HALBUM	IQLAQHASS-----LMS-II-Q-PLAP--KYLATAIERKSSVVEKICCFKLPQOF	1974
DPURPUREUM	VOIFSHHANS-----LMS-II-Q-PLQP--KYLSDSQERKSSIIKICCFHLIEAL	1971
PVIOLACEUM	VQLCQNLTS-----FMS-II-Q-PLTP--KYLSDSQERKSSIIKICCFRLVEAL	1967
AMPHIPOD	ERFFERHLKS-----IMN-LL-S-CSLP--SRP--EQ-LCVLTKGLAALRLQLL	1873
SHRIMP	QNFLLTVISA-----VMA-GM-S-APVH--GRS--DEQ-HKLVTKVGSFMILQIM	1854
MUDCRAB	VSFIDVIKP-----VMA-GM-S-LTIQ--GRS--DEQ-QRLVTKIGSFKILQVI	1849
TARDIGRADE	MDFFSRMTKD-----MIT-IL-D-TKER--STT-----AGLLIVQTCFSLLELL	1886
HYDRA	KQFFQRNIV-----FTS-HI-D-EKFN--KLL--QSKLASQLINKICSFNVLSLM	1802
SALPINGOBECA	SAFYIKRLPA-----IMS-IM-S-QDTP--LTS-----TPAVIKMCTPFLIDIL	1848
SPIDER	INFFLSHIRE-----IMK-TV-K-ENLS--LA--SGVKDIIHVKKICCFKLELM	1865
LIMULUS	TDFFVKMIRS-----IME-TV-S-SKVI--RGS--EERIKAOILLIKIGAFQLEVL	1865
SCORPION	KYFFLDHKE-----IMQ-IV-K-SKAK--SS-----NEIQVSKIGAFQLEILL	1859
ROTIFFER	IDFMSANIVS-----LIE-VL-N-W--NLN--EPFEMMLANKVFPQLELA	1837
CIONA	IQFFQTNISH-----IMS-VV-Q-EEHI--KYP--ESKSYQLQMKCLAYRLELM	1874
OCTOPIUS	VEFLKSNIPA-----IVN-IV-E-AEMS--QLP--D-LMBQHLTDMKCCFQILEVM	1826
CAPITELLA	TEFYCEHIKE-----IMK-II-E-AKPT--KAP--EHAFAEQITKIGCFLEVM	1876
LIMPET	IEFFLTHISF-----IMS-EI-E-AKLV--RGS--KAELENOITTKIGCFQMLELL	1858
SCALLOP	IEFFLDHME-----LRS-IL-E-AKQV--KGP--GLENQVSKTGCFLIDIM	1894
LINGULA	SEFYVDHIF-----ITD-TL-S-AKLS--KSS--ESEIERLLTKLCCFELVEVM	1875
OYSTER	LEFFTDHMGD-----LRT-TV-E-AKLV--RGS--GLENQVSKLCCFQLELM	1865
SNAIL	IEFFLDHILD-----LMR-IV-E-QNLA--RGP--ESILKQVLSKVVCCFQLEVM	1873
SPONGE	LEFFVLKISD-----VMC-IM-E-AKLA--RVT--DPKLEQVLVHKSCEFQIEIL	1886
PRIAPULA	VEFFRCHLVE-----IIG-II-E-AKVV--KLP--ERQYESQLISKICSLKLELM	1886
DANTIO	SQFFISNAD-----IMT-TL-Q-TRFT--KSV--ESVFESQIMMKIGCCKLEVL	1891
ESHARK	KEFISKIID-----AMG-TL-Q-SRPT--KTS--ESSFDQITKIGCYKLEVL	1887
BESHARK	REFPCKIVKD-----AME-IL-Q-SRPT--KTN--ESSFDQITKIGCYKLEVM	1886
XENOPUS	ISFFTNIIISL-----AMD-TL-K-SRPT--KVP--EAAPDSQITKKGYYKMLEVQ	1902
STERLET	KEFFCTVGD-----IMG-TL-Q-ARPT--KSS--ESTFETQITKKNKCYKLEVL	1903
GAR	RGFFCKTIAS-----VME-TL-Q-ARFT--KLN--EAMFEGOLIKKNKCYKLEVL	1891
HUMAN	REFFTIVVD-----AID-VL-K-SRFT--KLN--ESTFDQITKKNKGYKILDMV	1880
PLATYPUS	KEFFYRIIVG-----AMD-ML-K-SRFT--KSN--ESTFDQITKKNKGYKLEMM	1884
TASDEVIL	REFPSSIVE-----ALD-VL-K-SRFT--KLS--ESTFDQITKKNKGYKLEVL	1886
COELACANTH	KEFLCKNILD-----VMG-TL-Q-ARFT--KSN--ESAFDQITKTKGICYKLEVM	1891
CAECILIAN	KEFFCKIIH-----TMD-TL-K-GRFT--KSN--ELAFDAQIMMKMSYKMLEVM	1893
CANARY	RVFFGKIIIVE-----AMD-TL-N-SRFT--KSH--EHTFDQITKKNKGYKLEVM	1882
OSTRICH	REFFGTIIVQ-----AMD-TL-N-SRFT--KSN--ESTFDQITKKNKGYKLEVM	1852
GECKO	DDFFCKIIVE-----AMD-SL-T-SRFT--KSN--ETMFDQITKKNKGYKLEVM	1891
TURTLE	KDFPCKIVLE-----AMD-TL-K-SRFT--KSN--ESAFDQITKKNKGYKLEVM	1891
ALLIGATOR	KEFFSKIVVE-----AMD-TL-K-SRPT--KSN--ETVPNQITKKNKGYKLEVL	1849
APLYSIA	IEFFSSHIE-----LIN-NI-D-CKLN--KSS--ESVFAHQITKSGSQLEVM	1899
TRICHOPLAX	KDFYVSHIKE-----IMD-II-E-TKLV--KTA--DLENOLISKIGSKYKMLKIM	1861
SOFTCORAL	REFFYVDHIK-----IME-II-E-TRFS--KAT--DSVFESQVSKLCCFQLELALL	1882
STONYCORAL	RAFYQDQIQ-----LMS-VL-E-AKEL--KPT--DPNFESQVSKLCCFQLELIL	1903
SEA ANEMONE	SEFFSSHVKE-----IME-II-E-AKQL--KTY--DPGFESQVSKMCAFRMIEVL	1875
SEACUCIE	IEVFORNIRD-----FVD-IL-E-NKLL--KIS--EAVFAHQVSKICCFELIELL	1876
LANCELET	TEFFTDHIRE-----IMD-II-G-APQT--KAG--EASLRTQITNKLCCFQLELTM	1906
STARFISH	SSFFKECIRN-----IGS-II-D-AKTI--KAP--ETVFNQITVSKTCCFQLELVM	1912
SEA_URCHIN	VTFFYKGIHD-----IIS-VL-E-ARLT--KNP--VPAPENQVSKICYFELIEVL	1901

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	KRMSTPQIK---KQLHQH---LKF-----QADNFI--TKKLLVD--NKASKF--	1793
TETRAHYMENA	KALSLDKLX---DDVHKK---LYPDT-----TQGNRI--TKSLIKLI--FEYRKK--	1896
STYLNONCHIA	RRRLKPELIR---QQVHKK---LYGES-----SPGNEL--TKSLIQLC--LAKAKA--	1885
APHANOMYCESa	TCLSGDAVR---RLVNPV---YAATA-----GAKGNEL--TMRLCKTQ--SOKSAS--	1762
APHANOMYCESb	YCLSGDAIR---HSVNPV---YAD-A-----PAKGNEL--TMRLCKAM--SOKSAN--	1719
PHYTIUM	RLVDPESIR---GEINRA---FLGHD-----NGKREEL--TMLVCKCK--SKFITK--	1865
PLASMOPARA	RLVDPDIR---SKINSA---FLGHK-----SGKREEL--TMLVCKCK--SKVVTK--	1862
BREMIA	RLVDGELIR---TDINAA---FLGHT-----NGKREEL--TMLVCKCK--SKLVTK--	1848
AEDDES	VAIQRYDYL--TDDCIVAKA---LYG--ESG-----KIPGNRI--ITDLTKRY--YAARSEV--	1916
MIDGE	AATVPCSITE-K-----ESF-----TYG--GKL-----EVKREEL--IKDFIKRQ--MEVTRVI--	1866
BOMBUS	AKLIQWDD--NBSVITRN---AID---N-----VVTKREL--LHSLYSML--MLVR---	1788
ANT	ARVBNKID--AN--GTIAQN---ELD---Q-----LLDQNH--VRELFNML--MQQSP--	1816
WHIPWORM	DLLSLDQLK---GPVNEA---FCH---GK-----SVDKREL--IKKMVSLV--SVASRQL--	1867
TRICHIANELLA	NELDLECLK---NEVNVV---YLG--SD-----SQMKREL--IKKLVSCV--VGAKEP--	1875
BEEBLE	LRLCPLOQD--SEISRIQTQA---ALP--Q-K-----PNKREL--LQLLKFPLN---AI--	1779
BARNACLE	ASLPKDQTH--AATSPLVTA---FA--GAT-----ARGNEL--TKALLGSV--AAAFKTP--	1802
THRIP	GFPMKSLLE--EKGSSELVQA---AFSGSETK---VTSKREL--YTLIVKTK--LAAAFQN--	1816
FLEA	YLSDPSEIF--DASNPIILRS---F---PDFK---QENPREV--LSTLTRKQ--FKARTF--	1813
WHITEFLY	GYLDRSDFD--TEWF-----KTASKV---SSQDEF--LQKLLKVV--VEPKNC--	1848
TICK	SCCPKDDVT--GRQSSVNAA---FCRSRGIV---DVVQREL--TKEITKHN---NSAK--	1836
TERMITE	VHLESSELE--SKECVITAA---AF--PGAV---KTKREL--ISDLSRNV--YKYSRTEL--	1883
DAPHNIA	IVRVYQNTL---GHLNANFCALRCGQQ---PSENGREL--LKYIMQLV--LNIRKATA--	1741
OSTREOCOCCUS	QKCKDQQL--LDGPRSKVPKL---N-----ALVRSKI--MFLSGLGQ--VAGKAAQ--	1852
STENTOR	AKLPSNRLE--EN---VHKA---LYGPG-----SQGNEL--TKQITVTV--SKYRKE--	1674
KLEBSORMIDIUM	LRLSAEQLR--EKCGVPKQK-----FVH---TRVYH---LQVYIRG--	1993
CLUBMOSS	TOVDKERIT---F-S-----YQNL---MKF--SNDTRG--	1805
MOSS	SKADNVSI--KTIAPVF-T-----FSDI---MRO--GDTCHG--	1908
LIVERWORT	LKVDAPLIK--EKITPSA-S-----NAIL---MKV--MESRA--	1933
LIGNANO	MACGLTELA--LPR---LCDAFKRFYSRQP---A-AQKDPDRSI--SNWVSVQV--DVLVTQ--	1990
COPEPOD	SRLDQSTLH--KECGIIVEQAKAVFKKHSLLP---PQKDKDL--AIYLLPYL--GDSRQKLS--	1828
GLOBOSUM	KRLPPSELH--SAKGRILQA---YVGPS-----KSGEREL--TIALIKS--VDFKKK--	1788
PALAUSTRIS	SRLDTHDVH--STAGNIVKA---YCNQT-----PKTKREL--SVDLKLK--NTSKNE--	1839
NEOCALLIMASTIX	EYLPNTEVN--GANSPINKA---PCDGN---VKNGREL--LTNLMKPV--YAIARSVT--	1918
GLOMUS	LRASEEDVY--SEKGEIVKA---YQSR-----PLKREL--TRKVMERK--HKIKSRAD--	1973
LOBOSPOR	MRLPSEMVN--TKDSKIVDA---FT---G-----HKTTREL--TVDVFRV--NAAFKQD--	1897
SYNCEPHALASTRUM	LVRVHGGIP--GRSEVSKK---WEQETGMMPDKADAKKIM--MTKLVDSL--DQAKSE--	1881
FUNGIIVORUM	RILDPQPIR---EIMMR---FSGE-----AAKREL--TASVMBL--SINKCD--	1863
HALBUM	ESLPAVTVR---DQVNPY---PTGDK---HDAKREL--TAAIMKA--HSAKSE--	2017
DUPURPUREUM	QSLSTNLIK---EKINPY---PY-DK-----PDSKREL--TAAIMKA--HSAKSE--	2013
PVIOLACEUM	QSLSSTLIK---DTVNPY---PY-DK-----PDAKREL--TAAIMKA--HSAKSE--	2009
AMPHIPOD	AKLSRQDQF--SSASAVNAV---VNPAD-----ASKREL--TKELLKRV--LRLAKG--	1917
SHRIMP	SKLPREKLF--APGSEINAA---FRPGD-----QSKREL--TKEIFRY--AKISKG--	1898
MUDCRAB	SRLPRELIF--NPGSEINAA---YQPSD-----TSKREL--TKDVLRS--SKVAKG--	1893
TARDIGRADE	CVTLSQGDLE--SPTSKVLLA---FCAIRDQPA---VTKREL--IQFVTRC--NEFAHK--	1934
HYDRA	ELLGKEELT--SATSTIVQT---PCPNV-----STKREL--TVFLSKS--SQSYKE--	1846
SALPINGOBECA	QRLNNTDLY--GKSAVINKT---YCEAAGEPV---NDKQSHL---TTN--CRALRD--	1893
SPIDER	STLNKDLH--SKESEIVET---YLGRK---P---EVENEL--STDITKL--LEFKKF--	1910
LIMULUS	SCLPKELIS--SKESLINKA---FCDGN---V-----DTKREL--TTTELTRG--SHATKQD--	1910
SCORPION	TYLSKEEVS--KESQ-I-----N--C-----SHKREL--TREAQTE--LAAARKE--	1896
ROTLIFER	KRLKHEEFT--FTMAKICMA---YFTKFCQV---KQKREL--TKEVLRG--RKHME--	1885
CIONA	ALLPEDQL--KPPSPVNHV---PTSSQ-----LQSSREL--IKTFMLR--NRDRNE--	1919
OCTOPUS	RSMQVKELE--GPGSEINSV---YCKARNIEA--QMIVKEM--TKVITRI--HOTKKE--	1876
CAPITELLA	SRLPNTDYN--SKDSINKS---FCSPK--IP---DTKEM--NLITIKV--NATKGE--	1922
LIMPET	SRLTKDEVN--SKNSVINEK---YQCTK---V---ETKEM--TQKATKC--HEARSE--	1903
SCALLOP	SHLAKENVS--SKNSVINEK---FCQIKNEPI---KTCSEM--TRVIMKI--HAAKGE--	1942
LINGULA	SSFPKEEVN--SKNSKINKL---YCGGK---V---ETKEM--TTAVTKA--HEAKKE--	1923
OYSTER	GRLSKEEVF--GRSSVINCK---FCEVKSINV---DTKEM--TQVIMRT--HEAKGE--	1913
SNAIL	SRLSREEVN--SLSSEINKK---VCPGK---P---ETKEM--TQKIKAK--NNAKSE--	1918
SPONGE	TRLPSSLIS--SMESTVNTA---YCNVS---P---QTKREL--TQAITK--CHGAKSE--	1931
PRIAPULA	ACLPKEDVY--GRDAALQV---FLASR---P---AGKREL--TPVITRL--CYDACRE--	1931
DANTO	SRLPKDEVY--SKNSAINQA---FCGTG---C---ABNREL--SKNLLKS--FEAFTE--	1936
ESHARK	IRLPPDDY--SKDSINKA---FHSS--N---MBSREL--SKSLK--CYDAFTE--	1933
BHARK	TRLPKNDY--TDGSKIIQA---PHSAG---N---IBNREL--SKTLKKS--YDVTTE--	1931
XENOPUS	SRLSKDEIV--ST---VNNA---YHVSS---K---PEBREL--TKALIKL--YDFTTE--	1944
STERLET	SRLPKEDVY--SKESLINAQ---FCRPN---K---ABNREL--SKNLLKS--FDFTTE--	1948
GAR	SRLPKDEVY--SKESKINQV---FCGPS---R---AABREL--SKTLKKS--FEAYTE--	1937
HUMAN	SRLPKDDVH--AKESKINQV---FHGSC---I---TEGREL--TKTLIKL--CYDAFTE--	1925
PLATYPUS	SRLPKDDVH--SKESRINRA---FHGSS---V---IBNREL--TKTLIKS--CYDAFTE--	1929
TASDEVIL	SRLPKDDVH--SKESRINQV---FHGSS---I---VEGREL--TKTLIKL--CYDAFTE--	1931
COELACANTH	CSRLPKDDY--SEQSRINQA---FHGSC---S---AQRREL--SKTLKLL--CYDEFTE--	1936
CAECILIAN	SRLTKEDYI--SKGSRINQA---FHGSS---N---ABNREL--TKLIVKS--CYDSFSE--	1938
CANARY	VRLSKEEVY--SKDSINKA---YRGSN---S---VEGREL--TKTLIKS--CYDAFTE--	1927
OSTRICH	VRLSKEEVY--SKDSINKA---YCGSI---S---VBNREL--TKTLIKS--CYDAFTE--	1897
GECKO	SRLSKEEVY--SKDSINKA---FLRST---C---VEGREL--TKTLIKS--CYDAFTE--	1936
TURTLE	SRLSKEEVY--SKDSINKA---YQGST---N---VEBREL--TKTLIKS--CYDAFTE--	1936
ALLIGATOR	SRLSKEEVY--SKDSINKA---YQGTI---N---VEBREL--TKMLIKS--CYDAFTE--	1894
APLYSIA	SSLSKDDVN--SKTSAVNLR---FCHGK---V---DTKEM--TQRTKAK--QEAKE--	1944
TRICHOPLAX	SKLSKQDYN--TAESSIVKA---YTRGP---T---EDKREL--TKSITKA--HACKSD--	1906
SOFTCORAL	ARLEKTVS--SMESRINKA---YNN-D---V---KTKREL--TMAITKA--HAAKSE--	1926
STONYCORAL	SQFSKSELN--TLESTINKA---YVGGD---V---KTKREL--TLAITKA--RAASIE--	1948
SEA ANEMONE	SRLGKAELN--SPQSSINLA---YCP-N---D---NTKREL--TKAITKS--HAAKSE--	1919
SEACUKE	TRLGKDQLN--STTSVINSV---YCMGD---C---KTKEM--TQGITKA--HFAKSE--	1921
LANCELET	SRLPKDEVN--TPPSRIVRA---YKGEV---V---KAGREL--TTAITKF--HAAKSE--	1951
STARFISH	SRLVKEDLF--SMDSAINKA---YTN-D---V---KTKEM--TQALTKA--HAAKSE--	1956
SEA_URCHIN	SRLSKDDLN--SKDSALNRE---YRHGN---V---EKREL--STALTKA--ALGARNE--	1946

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	KFEK--INILNI--NQKEILLSOVNYLKIIVEDYQSSAFITFIYIVLMK-----	1836
TETRAHYMENA	GFER--ADDIKNNVQNPDLIGDSHSILRLFSIAVNICLSLITPK-----	1941
STYLNONCHIA	PIDG--FVNFVKDSIKSEFPQYNSPLQVQRYAAATICTDILIMG-----	1930
APHANOMYCEsA	-----ADRPVAIAARCLISIVRT-----	1782
APHANOMYCESe	-----PENSCAVAAARCLIVVVRK-----	1739
PYTHIUM	-----THDGLGETTRFSCSAANCLIAVSR-----	1892
PLASMOPARA	-----IYLEADDLVRLACAAANCLIAAISQ-----	1889
BREMIA	-----EYSNVDELNRMACAAARCLISAVSR-----	1875
AEDDES	--F-----LTPDSPTAELFRKYCAARCLIAANISN-----	1946
MIDGE	--TF-----IVDDPKROELFRQFHCYCRMASIVSN-----	1897
BOMBUS	--ML-----RTHEPELKETTRLLHSAANCLIAIVSN-----	1819
ANT	--LK-----ITRIFGCQKLVRLLSAAANCLIAISL-----	1846
WHIPWORM	--LG-----A---DTWRVRSWQLRGAANCLIVAVLKK-----	1895
TRICHIANELLA	--CR-----DSKLDISQKHFFEYRGAANCLIVHLVKK-----	1906
BEEFLE	KDT-----IDCVVEYEELFRLYKASNCLIAISIVCNS-----	1811
BARNACLE	PLR-----CMEPASLSEARRRCMAANCLIAAVSAL-----	1834
THRIP	PLN-----FEGISDAKELYRQYLCAIYNYLIAVFCNKTKQ-----	1851
FLEA	MNY-----DENDTESAELFRQYCTAIKIKLCHLCSL-----	1845
WHITEFLY	--TS-----NFKSADYEDALRRYHCASFTATMLCINAKRDVPSSESKDS-----	1892
TICK	KEV-----VRRDVEFAGLWRQLRGAARCLIVAVVSC-----	1868
TERMITE	HDN-----LTGNVQLVELFRQSCAAARCLIAVLIISNV-----	1915
DAPHNIA	PFN-----EENELEIYQDMEFESRLVLSIASV-----	1769
OSTREOCOCCUS	-----CGQENI--ALRVYH--MPLFPCSLIAK-----	1877
STENTOR	RPEK-----YELDISASDDYLRQFCASRCLIACTIRK-----	1708
KLEBSORMIIDIUM	KERL-----K--VMGTAABQSPESAQRGICGAANCLIAIKSL-----	2032
CLUBMOSS	KNDP-----R-----VYFPQENVSFWRDLHSAANCLIAAVVMCC-----	1839
MOSS	KLDP-----E-----YKLYPENLSTWRDLHSAANCLIAAVILCC-----	1942
LIVERWORT	KNDP-----V-----TCLHFENCTLWRDLHSAANCLIAAVITLR-----	1967
LIGNANO	-----SFPRCRESARQMOCAANCLIAVHCIAK-----	2017
COPEPOD	GLE-----ISSEVLRPLYRKYHCAANCLIACTIISCC-----	1859
GLOBOSUM	P-A-----FEERSIASYRLIWNATAPAVAVCLLAL-----	1818
PALUSSTRIS	NFR-----EPPGVASFRTTYHGAANCLIAVAVIAL-----	1870
NEOCALLIMASTIX	NIN-----SNNEDYLKANKYYKSSYCLIAAMLYC-----	1949
GLOMUS	KDD-----NGNKLYSEANLHFRCAANCLIAAVILCC-----	2004
LOBOSPOR	STP-----MT--PETAALREDYRGAANCLIASAILCC-----	1927
SYNCEPHALASTRUM	QNP-----QAEVLVETRLRYHGAANCLIAVAILN-----	1912
FUNGIIVORUM	PHLVHSLRPPRDDASNEDKTYLFRNRCFYHGAANCLIAVSR-----	1910
HALBUM	KLAT-----DQHVTRVLTATKYHGAANCLIASVAVAT-----	2049
DPURPUREUM	KLTS-----DDRVTYVTRSLCTMYHGAANCLIASVILAA-----	2045
PVIOLACEUM	KLTS-----DDKFVTRQCLTYHSAANCLIASVILCC-----	2041
AMPHIPOD	ELR-----HDTTHAELRRLCASAAANCLIAAILIN-----	1947
SHRIMP	ELR-----HDQTHAELRRLCASAAANCLIAIVLAC-----	1928
MUDCRAB	ELR-----HDQTHAELRRLCASAAANCLIAIVLVC-----	1923
TARDIGRADE	NVA-----SEPGMEVRRLFHGAANCLIAAVATA-----	1964
HYDRA	SYN-----ENNMELOKRYHGAANCLIASIISCC-----	1874
SALPINGOECA	TVT-----GEESLVELRRQASGAANCLIAVITVICK-----	1923
SPIDER	SYE-----TEPEYKVLRLKLANCAANCLIAVIVVSC-----	1940
LIMULUS	DLR-----GETTLYDIRRRLSAAANCLIAVIVVSC-----	1940
SCORPION	NLE-----GESISKFCRYHGAANCLIAVITVICK-----	1926
ROTIFFER	YVNFVNTQGE-----SAKLEANKOLERLHSAANCLIASITLR-----	1923
CLIONA	NMK-----GEKVLLEERRQFHGAANCLIAVIVVSC-----	1949
OCTOPUS	DVH-----GETLPLELRRQVHGAANCLIAVIVVSC-----	1906
CAPITELLA	NMN-----GETLLIPLRRALHGAANCLIAVIVVSC-----	1952
LIMPET	DTR-----GETELVELRRQYHGAANCLIAVIVVSC-----	1933
SCALLOP	DTR-----GETTLLSLRRLHGAANCLIAVIVVSC-----	1972
LINGULA	DVR-----GEKRLPELRRQYHGAANCLIAVIVVSC-----	1953
OYSTER	DVR-----GETSCVELRRQYHGAANCLIAVIVVSC-----	1943
SNAIL	DTR-----GDFMVELRRQYHGAANCLIAVIVVSC-----	1948
SPONGE	DLH-----GDRTHYETRRQYHGAANCLIAVIVVSC-----	1961
PRIAPULA	DMR-----GERALLELRRQYHGAANCLIAVIVVSC-----	1961
DANTO	NMT-----GEMVLELRRQFHGAANCLIAVIVVSC-----	1966
ESHARK	NMT-----GESQLEKRRQYHGAANCLIAVIVVSC-----	1963
BHARK	NMT-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1961
XENOPUS	NMC-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1974
STERLET	NMA-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1978
GAR	NMA-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1967
HUMAN	NMA-----GENQLEKRRQYHGAANCLIAVIVVSC-----	1955
PLATYPUS	NMA-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1959
TASDEVIL	NMA-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1961
COELACANTH	NMA-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1966
CAECILIAN	NMA-----GETOLFEKRRQYHGAANCLIAVIVVSC-----	1968
CANARY	NMA-----GESQLEKRRQYHGAANCLIAVIVVSC-----	1957
OSTRICH	NMA-----GESQLEKRRQYHGAANCLIAVIVVSC-----	1927
GECKO	NMT-----GETOLLEKRRQYHGAANCLIAVIVVSC-----	1966
TURTLE	NMA-----GESQLEKRRQYHGAANCLIAVIVVSC-----	1966
ALLIGATOR	NMA-----GESHLLGKRRQYHGAANCLIAVIVVSC-----	1924
APLYSIA	DCR-----GESLVELRRQYHGAANCLIAVIVVSC-----	1974
TRICHOPLAX	DLR-----GETRSVELHRQCCGAANCLIAVIVVSC-----	1936
SOFTCORAL	NMQ-----GETVLLPLRREYHGAANCLIAVIVVSC-----	1956
STONYCORAL	DMR-----GETVALELRRQFHGAANCLIAVIVVSC-----	1978
SEA_ANEMONE	DMR-----GETVAFELRRQLHGAANCLIAVIVVSC-----	1949
SEACUKE	NVG-----GEKVCIDLRQYHGAANCLIAVIVVSC-----	1951
LANCELET	DLR-----GETGLDLRREFHGAANCLIAVIVVSC-----	1981
STARFISH	DIR-----GETNALELRRQFHGAANCLIAVIVVSC-----	1986
SEA_URCHIN	DCR-----GETVALELRRQFHGAANCLIAVIVVSC-----	1976

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----TKK--ENIYAHLLKPKER---DISYDQVPIIK-----EWFQF--NFOV-	1871
TETRAHYMENA	-----NK--ENILNQFLPQOK---NDHLQDLIDG-----TQKE--NFEI-	1976
STYLNCHIA	-----TK--ENLISQLFLATLRDKGEECPNVLIDQ-----EKA--NFEV-	1968
APHANOMYCESa	-----TQ--EKFTQLLADADA-----LWPHIMAKTEDEGGDEY---SDET-	1819
APHANOMYCESa	-----TQ--EKFTQLLADQ-----LWPKIVDQ-----SQDY--IFET-	1770
PYTHIUM	-----KQ--EKFDQILFQEA-----LWKNIIDG-----ARE--SLKA-	1923
PLASMOPARA	-----KQ--EKLVDQILFQSA-----LWSNLVDS-----ALEY--ELRA-	1920
BREMIA	-----KQ--EKLVDQILFQPA-----LWSNLVDP-----ARQY--ELAA-	1906
AEDES	-----KED--LQLNVLLFRENADK-NEYIWRKLVIC-----TECHLYDSF--SQ-	1986
MIDGE	-----KDN--PLIYNLALFKES-SK-TGYIWRNPIDT-----KNEDLYGNFTQ-	1936
BOMBUS	-----KRD--EDNIA-SHLENRKK-EQLIWEHVIC-----QKQ--NFOQ-	1855
ANT	-----KKE--EYEM-FAVGNMKR-GLVILKRVIC-----DTQ--ELDQ-	1882
WHIPWORM	-----TQ--LKHVEGVVSE-----CFDHTIS-----ELK--EAGEW	1926
TRICHINELLA	-----SH--LKHVEGVVIND-----CHSHIIBK-----EVK--EDRE	1937
BEEBLE	-----MKD--ANFTKLFVRQEDN--KDILKSLIDT-----KKT--VFOA-	1847
BARNACLE	-----TTE--ARFTQTLAEAPER-NQLIWERLVDA-----ERRV--HLPVE	1872
THRIP	-----VAD--LKFVK-VLFAENT---RKFVRLVDD-----DKCY--MLPF-	1884
FLEA	-----KSD--LKFVTGLFRENPLK-KEIWRNIIIC-----KRIY--EFPQ-	1882
WHITEFLY	PSTSSVAKKRSa--LDFVTKFVSKLGTG-G--FMDKIILN-----KQNV--RHVD	1938
TICK	-----TTE--SQFDVVFVQERPEK-GEFLWNLVDE-----KAVY--TTP-	1905
TERMITE	-----KCE--LRFTGLLFSENK-A-KEVPKGLVIC-----NKPE--ALAL-	1951
DAPHNIA	-----PTLD--EESMDKLIIRPM-NQ-KFALANAMVIT-----TKR--NLVA-	1806
OSTREOCOCCLUS	-----TTH--VFKLKLKES-----TKSRLVIVR-----TKR--ELEA-	1908
STENTOR	-----SQ--EKVFNLELRDQ-----NKKLIEE-----KED--GKFD-	1739
KLEBSORIDIUM	-----GCP--NFBFLKESG--AK-EGFLKRVIC-----DKVY--DHEDV-	2068
CLUBMOSS	-----KQD--EKIENLLKFD---A-GNPLQHLVDC-----SKVY--SSPV-	1873
MOSS	-----LID--EKWNAFLSE---K-SRPLQHLVDC-----TKVY--DDMSV-	1977
LIVERWORT	-----EQ--EKVGLLFKEG---S-TGMIOHVLVDT-----IKVY--NEIPV-	2002
LIGNANO	-----DK--ERLNL-PPPTENAAK-RKFDNIIVPT-----DVDY--QLPL-	2053
COPEPOD	-----NFN--VNAVDTLIFRENKKK-NQFVSEIIDI-----SQPI--HLGL-	1896
GLOBOSUM	-----NISKVVEIINSVLFVEK---PCLWENIIVD-----SRPI--ELET-	1853
PALUSTRIS	-----RDQLVKKCTTLFLENKQK-QEDPKNVIDI-----HEDL--RDK-	1908
NEOCALLIMASTIX	-----TKK--ENFNVVLFQENDAK-NEKIWEHVIT-----HHKI--FKV-	1986
GLOMUS	-----NN--PVFKALFLAENTSK-GELLWENIIDL-----EIHV--KIKI-	2041
LOBOSPOR	-----KPK--EDFVRQLFRDNEAK-KEFVWEHVIL-----EAKK--HFEO-	1964
SYNCEPHALASTRUM	-----TKK--EALNGQLLKA---R-KAGHWEIIDL-----KKK--ESPURT-	1948
FUNCTIVORUM	-----TKK--ENFSVVFRENKDK-GEBD-----KEDV--KLEV-	1937
HALBUM	-----TKK--EFTHVVFKENKDK-NEYLWEHVIL-----EQOY--NEEP-	2086
DPURPUREUM	-----TKK--ENFLHVVFKENKDK-NEYLWEHVIC-----DQOY--NES-	2082
PVIOLACEUM	-----TKK--ENFLHVVFKENKDK-NEYLWEHVIT-----ELE--KEP-	2078
AMPHIPOD	-----DD--LKFVNNFLVQNTAK-GEALWAMIDV-----NQLK--EFEE-	1984
SHRIMP	-----ND--LRFTNLFLSANPTK-GEVWECLVDC-----SRNL--EDV-	1965
MUDCRAB	-----KDD--LKFVTSFLNANPTK-GEALWECLIDC-----NRNL--QFDI-	1960
TARDIGRADE	-----PIA--LKFVHLCLFEQNAEK-GKILWMLVLD-----KROV--TEV-	2001
HYDRA	-----NE--MKFVAGLFLAENLLK-GSFVLENVLD-----KKEV--NKKS-	1911
SALPINGOEA	-----TQ--EKFNAPCFKEATGK-VRDVFHLIDE-----KRVY--TTT-	1960
SPIDER	-----NE--LKFVNAFLKENPAK-NEYIWRKRVIDE-----DIKL--TSM-	1977
LIMULUS	-----SD--PKFTVFLFQENSAK-REFVWEHVIL-----RKE--YFPV-	1977
SCORPION	-----TD--SKFSTFLFQENPAK-GEVWEHVIL-----NKE--TPT-	1963
ROTIFFER	-----TTE--PKLILALFKDDPSK-NFVFEPLIK-----IKS--MFCV-	1960
CIONA	-----SS--IKWVFLDENPSK-QQYFIANVLD-----NKNV--TNDT-	1986
OCTOPUS	-----TD--LKNVFLFAENEEK-KEFLDNIIDK-----EKK--SPI-	1943
CAPITELLA	-----KKE--KKVTAFLTENPAK-NQLWNNIIVDQ-----DVVY--EPL-	1989
LIMPET	-----TTE--AKFNCLFLSEKPSK-GQFLDNIIDC-----EKMF--EKA-	1970
SCALLOP	-----TTE--AKFVQVFLKEDETK-GDFLDDNIIDK-----ERTV--EFT-	2009
LINGULA	-----TTE--MKFTGLLKEDEK-GDFLDDNIIVDQ-----NRKY--LFEI-	1990
OYSTER	-----TD--AKFVTAFLKEDEAK-GQVFDNIIDK-----DKAY--VTSS-	1980
SNAIL	-----NE--HKVKGFLFQDNTSK-GQFLDENIVDR-----DQKV--EPL-	1985
SPONGE	-----SKK--PQFVGLFKEDVVK-GQLWDMIIIC-----EKVY--EQV-	1998
PRIAPULA	-----TTE--PVYSSLLQENPAK-GQLWDMIIIC-----HRRV--GDR-	1998
DANTO	-----FNE--TKFVQGLFTEKPK-NQFIDMLIS-----QRVY--NPT-	2003
ESHARK	-----FTE--AKFVQGLFSEKAEK-NIFIEHLIA-----KRT--NFPV-	2000
BHARK	-----FTE--AKFVQGLFSEKPEK-NIFIEHLIS-----QRVY--NFPV-	1998
XENOPUS	-----FSE--LKFVQGLFTEKKEK-NLLIEHLIDL-----QRN--TPI-	2011
STERLET	-----FNE--TKFVQGLFSEKPEK-NQFIEHLIDA-----KHTY--SFPV-	2015
GAR	-----FNE--TKFVQGLFTEKPEK-NQFIEHLIDA-----QQTY--RFPV-	2004
HUMAN	-----FNE--LKFVQGLFSEKPEK-NLLIEHLIDL-----KRRY--NFPV-	1992
PLATYPUS	-----FNE--TKFVQGLFTEKPEK-NLFIENLIDL-----KRCY--TFPV-	1996
TASDEVIL	-----FSE--MKFVQGLFTEKPEK-NLFIENLIDL-----KHCY--TFPV-	1998
COELACANTH	-----FTE--SKFVQGLFSEKPEK-SLYIENLIDM-----KCSY--NPT-	2003
CAECILIAN	-----FTD--AKFVQGLFTEKTEK-NLLIEHLIDL-----QRCY--TFPV-	2005
CANARY	-----FTE--SKFVQGLFSEKSEK-NLLIEHLIDL-----KRCY--TFPV-	1994
OSTRICH	-----FTE--SKFVQGLFTEKTEK-NLLIEHLIDL-----KROV--SFPV-	1964
GECKO	-----FNE--SKFVQGLFTEKPK-NLLIEHLIDL-----QHRV--SPI-	2003
TURTLE	-----FTE--SKFVQGLFTEKPEK-NLFIENLIDL-----KRN--SFPV-	2003
ALLIGATOR	-----FTE--SKFVQGLFTEKPEK-NLLIEHLIDL-----KHQ--SFPV-	1961
APLYSIA	-----TD--IKWVFLQDNVVK-GQFLDNIIDM-----DFAH--SDI-	2011
TRICHOPLAX	-----TTE--MKFTVFLFLENVAR-KQFLWENLIDM-----ERE--AFEI-	1973
SOFTCORAL	-----TTL--LKFVNGFLFSEDLK-GQFLDNLVDC-----TKKL--HFEM-	1993
STONYCORAL	-----TD--LKFVVAFLFSENPIK-GQLLDDNLVDC-----NRTY--TEV-	2015
SEA_ANEMONE	-----TTE--LKFVTAFLFENPVK-GQFLDNLIDT-----DRKY--EFV-	1986
SEACUCU	-----TD--VKFNALFLQENPAK-GQFLDENIIDE-----ERSV--EFV-	1988
LANCELET	-----TD--MKFVTAFLFQENTAK-GQFLDNLVDT-----NKLY--QDA-	2018
STARFISH	-----TD--IKFNALFLSENTAK-GQFLDNIIDI-----TKNV--SPT-	2023
SEA_URCHIN	-----DN--IKFNALFLSENHAK-GQFLDNLVDP-----KKEV--GAI-	2013

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-ETNFEKPLYTEVKKQ-----QQDYFQ-----EKI	1903
TETRAHYMENA	-ETNFEERSYARTRNIFPSRIKPKFDTKBI---LCKKVLN-----ETVL	2020
STYLONCHEIA	-ETNPNFYIQLKQIEFKIEQANGDISQI---KANNL-----INEYNEK	2007
APHANOMYCESa	-QTAAFPPTYKLSR-----RQGR-----SRTTHRGNRLMDI	1850
APHANOMYCESa	-ETTSFPPTYKLSD-----ARKR-----TQLRQFORMDI	1797
PYTHIUM	-ETKAFDRVPLSSFSARTLRNQQEQOQTGGT-----QSTSHTGKRNSST	1967
PLASMOPIARA	-ETENFVTIPLSSSLSTVSLKQRYEVD-----VLENVTRKRNNSA	1958
BREIMIA	-ETEITFTIPLSTLSTVSLQSKLDS-----NMASTNQKRTTEST	1944
AEDDES	-ELEDYPKIKDKIVSIQRLSSDSGKSHS-----NRFKYI	2019
MIDGE	-EFDELPSLREYIVSIKDLQTASTTSSQ-----RK----	1965
BOMBUS	-TVAENPKYRKRRLVNIKRRIKQR---Q-----ASSHSYI	1886
ANT	-TFEYFKREIIVNIKRTTEVDKGR-----QTHRYAVY	1915
WHIPWORM	FAEEESDQQTDDMSGLNRVLY-----KKAPSI	1954
TRICHINELLA	IQEEESAGKMYYSRQDRPSSA-----EYENQV	1965
BEEBLE	-DFDNIKQTKILLNIRDEMRLRKRNN-----K-----QTQSVRYI	1883
BARNACLE	GGS---ELRRHVSIIPRPAAGAGGQAP---RRTGS	1902
THRIP	-QOHEHLKNVEKIVSIRRNVEAKS-SQ---RM-----NAHKSLLQ	1921
FLEA	-EFENYPKTKKHLVIRKAASVDSE---ELNYL	1911
WHITTEFLY	FNSDELPKQKTLVSIIRRAARSET---GRA--PI-----QGS--MDI	1973
TICK	-EREVLQKTRHVGVTEGVPS-PSFSGRMAGSL-----RGSLLAQE	1946
TERMITE	-DWEEIPARRKQLVIRCARAQRRETLGFASQSV-----RYIPS	1990
DAPHNIA	-EVERHRKFRHLHL---T---V-----SSENRP	1833
OSTREOCOCCUS	-EAINPEPDSAEISLKS-----PTRDVSVF	1933
STENTOR	-QTLFVTEKLEIV-----DEPKL	1759
KLEBSORMIDIUM	-ETAELSGARETLRGLRAERKARESRMAA-----GAASQAHAHL	2108
CLUBMOSS	-QTSVLVESHAIKGIKRAMIKGHGPRR-----GTSMTL	1906
MOSS	-ETSQSSIISQTVKMRADLKARRTRGKGS-----LSQASTI	2014
LIVERWORT	-ETNQLASSFQTVGMRDERRSRK-TAQGD-----ISASLSTL	2038
LIGNANO	-QVEQASRKYLVSVRPAASSASDSSASEAGPTDDLWLNPPSSSSTAUSAAGTNSLQFA	2112
COPEPOD	-VLDKEFFKRKHLVTRQSDSSSSA---LDIGS	1925
GLOBOSUM	-DLSAPLIRVLGKD---F-----SEKVMNRKYL	1878
PALUSTRIS	-----LNDISLQS-RT-----IGTPLARSAYL	1930
NEOCALLIMASTIX	-EDGVPKPKKR--Y-YENIQYRK-----NIIRKQKDN	2015
GLOMUS	-ELNQPFPRTKVDDF-RRSRGTKF-----EAIVSNLKYL	2075
LOBOSPOR	-VLSGPLVKTRLSDL-RTKSLNPN-----KTYSTNYRYM	1996
SYNCEPHALASTRUM	-ELDQPLATTRLGEP-REKSGFRK-----QDNGPRVNYI	1980
FUNCTIVORUM	-ETNFSVKKVGSY---HA-----ESYTTESRQ-KRS	1966
HALBUM	-ETNFQISSQLSSA-----VANSQRDLKYL	2111
DPURPUREUM	-ETNPTVSPSSPQ-----SLFANDLRYL	2104
PVIOLACEUM	-ETNFINYNYPQ-----SLFSNDLRYL	2100
AMPHIPOD	-EVGVASKNTRSLVAVRQVLSKSDAVAEAR-----YQPTVLMF	2021
SHRIMP	-EINFKPASKKRFVAVRQKLRRETAREEGAV-----VAGTVQYM	2002
MUDCRAB	-EINLNPGSKRRFVAVRKNLKEANQSSGK-----AAGTVQYL	1997
TARDIGRADE	-EFIQAPRKKKQLAAIHKEAQDGSKNGVGSLSL-----FGIPTSTYASARLA	2052
HYDRA	-NVS--FERKVMPLIRKASCELGHQPNQ---RE-E-----NEVILSNN	1948
SALPINGOBECA	-ELPAAMSVRSKCVLALREGEATPS---TTAA-A-----TAAARYL	1997
SPIDER	-EIDDSVAKKKNFLAIRHQIRKVFNDSE--RDIS-G-----FQSSLQIF	2019
LIMULUS	-ELEAPMERKKKFLTIREGNKESNG---IE-N-----NFGSVHYF	2012
SCORPION	-ELDJT-TERRRKFI SVRHEKRELS-----NKTLL-N-----FASSLKA	1999
ROTLIFER	-EMENFQKRTKFIIRDEPKVADTMSRSA--NYI-S-----TMSFTSL	2003
CIONA	-EISQPLTKRKKVFAIRKKAEKEGEA---SIQYM	2017
OCTOPUS	-VFEMQPKKTIPIHFLQKEIKQKVADAS-----QSASYHL	1978
CAPITELLA	-EMENPIERRKKFVIRTSVRDVPDSE---PT-G-----PASSVHYL	2027
LIMPET	-ELDSPLEKRRKRVFVIRNEVKETRQG--E---EE-E-----SLFSSYNI	2007
SCALLOP	-ELTSPMERKKKQFVSLRKEVQERQEDGV---TM-E-E-----TEYSSFNL	2048
LINGULA	-EITSLPQRKKRVFVIRSEAGAQQDGNSS---QD-S-----AESSVHYL	2028
OYSTER	-ELKAPLSRKKQVSVIRNEVKESNSQNGE---AD-E-E-----GESSLHL	2019
SNAIL	-ELESQFERKKKQVFAIRSEMQEQS---DK-D-----GAISSYHL	2020
SPONGE	-DFEAPLKRKKQITSIRDLLKQSTAAG--NSSGSPSS---S-----PSTRPRYI	2041
PRIAPULA	-ELSAPLQRKKQFVAIRTAVREIDRDADG---QG-A-----PLPSVHYL	2037
DANTO	-EIDVPIERKKKVMIRKEVSG---ENGD-----APVYLS	2034
ESHARK	-EIEVPLEKRRFVIRKEAREAGDQDGS-----EPQYLS	2034
BHARK	-EIEVPERKKRFFAIRKEAREASAGSDS-----EPHYLS	2032
XENOPUS	-EIEVPMERKKKYFAIRKEARDASSTESD-----EPSYLS	2045
STERLET	-EIEVPLERKKKYFAIRKEARQGGEGSD-----EPHYLS	2049
GAR	-EIEVALERKKKYFAIRKEAREAGDRDAE-----EPHYLS	2038
HUMAN	-EIEVPMERKKKYIEIRKEAREANGSDS-----GPSYMS	2026
PLATYPUS	-EIEVPMERKKKYIAIRKEARDSVNDNSD-----EPHYLS	2030
TASDEVIL	-EIEVPMERKKKYIAIRKEARDAANGDSE-----GPHYLS	2032
COELACANTH	-EIEVPIEKKKKYFAIRKEARGSTIGDLD-----EPQYMS	2037
CAECILIAN	-EIEVPLERKKKYFAIRKEARNTANGESD-----APHYLS	2039
CANARY	-EIEVPLERKKKYIAIRKEARDAGNSSQD-----EPKYLA	2028
OSTRICH	-EIEVPLERKKKYIAIRKEARDAGNSGNE-----EPKYLP	1998
GECKO	-EIEVPLERKKKYIAIRKEARDAMVSDA-----EPHYLA	2037
TURTLE	-EIEVPMERKKKYFAIRKEARDAVINDSD-----EPQYLP	2037
ALLIGATOR	-EIEVPMERKKKYIAIRKEARDVNGGPD-----EPQYLP	1995
APLYSIA	-ELDSPLEKRRKRVFVIRSEAQKRGAGGAGSSGNS-----SATPSLHL	2055
TRICHOPLAX	-ELSYDQKQKTFRSLREQRSSVSSADEADSGIA---M-----APSYHL	2016
SOFTCORAL	-ELSAPLDKRTLLTSIRCEARATRMNSSE---NY-----E-----HGVSLRYL	2032
STONYCORAL	-ELSAPLERKKQFRM---QARIPSPK---ENSLEESAG---R-----TGLSIHYM	2055
SEA ANEMONE	-ELSTPLERKKQMTSIRINARVQSDOVEE---AL-----S-----QGRSVRYL	2025
SEACUKE	-EISAPLERKKKQFVALRQAAAS---GGTFDTGLG---S-----YQRSGRYL	2027
LANCELET	-EFSAPVSRKKQFVIRQELRQDQSPQAG---SSRY-	2050
STARFISH	-EMNAPMERKKRVFVIRNQIQDVTAGSSQSDSGIE---M-----SGYTRGYL	2068
SEA_URCHIN	-EMDAPVERKKKRVFAIRTAQARETNTPEES---G-----Y-----VSGPAHYL	2051

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLTA, EXPANDED

PARAMECIUM	VKNYLTAASLVE---VPTTMEIEEE---NENL-----	1925
TETRAHYMENA	SAAFLPANELLSKSEHDI-YEDE---EDESEN-----	2067
STYLONCHIA	CTFNKTFKAMVFECPDKINIKSEEEKLQK-----	2046
APHANOMYCESa	SDFLQGLSLGSAAPIEDT---NDDE-----	1874
APHANOMYCESb	SDFLAGSLSLGSSSEGLS-----	1817
PYTHIUM	ALQPTASLSOTMTSEIGSLQLDAE-----	1995
PLASMOPARA	ALQPTNSLSLMDAVTL-TASTVTEPPD-----	1985
BREMIA	ALQPTSSLMDAERV-GPSTMTASID-----	1971
AEDDES	QMTSVFSSSLSDVTKLNLNYSVVRTG-EMATRE-----	2053
MIDGE	TSSIFPHSLSLKLDLSHSVVFSNR-EALQKQ-----	1999
BOMBUS	ISYDSSSLSDINA-DPNETIIRN-----	1912
ANT	HSYVLSAMLEEDINA-DLKCWVLPAN-FHRSIST-----	1950
WHIPWORM	NEQHLWESLAPSVIQDFTSEFEPINT-ETT-----	1985
TRICHOINELLA	ELSVLLDSLVMADGDFTESLEARTH-CAETR-----	1998
BEEFLE	FLRVPNLSLAEDVKFDFTSSLRTQS-DDDA-----	1915
BARNACLE	VSRLLADSLGSLVDYDFTASVDSLGL-ELQQQ-----	1935
THRIP	LQSPFLAGSLSDIIRFDFTYSRLKPT-DNHE-----	1953
FLEA	TGQIFSSLSGDIIEFDMTHNVRRHP-VDHK-----	1943
WHITEFLY	SDFLAGSLSDLSVLDLNHRVVEVE-AVQEA-----	2006
TICK	ASQYLSASG---LAFVDET---VSDS-SRGT-----	1973
TERMITE	ASQYLFDSLNEAVTLDFSTSUVSSTA-RPGHD-----	2023
DAPHNIA	PSDFLFGSLSDVYRDFNQASLPTKFGSYDEEN-----	1869
OSTREOCOCBUS	TKGYTLSSSLAAMYSLTKTESCV---TS---DVTD-----	1961
STENTOR	SYVYLSLFLSQQAEIRAKKI-----	1782
KLEBSORIDIUM	SDFLNTSLRQGGVDFTLGQGARLQADGAV-----	2161
CLUBMOSS	SDFLVMGSLSQEFLVLSFVQDMSASLPEP-----	1938
MOSS	SDFYMSLSLSQEPAVIRTFVGGIRKEETS-AAGV-----	2059
LIVERWORT	SDFYVNIISLQEPAVISFVQSKDHSSEGSASL-----	2084
LIGNANO	ASQFLADSLSDVSDGLRLVTADLSNT-SDSASLATA---	2166
COPEPOD	QCHYLDSSLSDISHDYTASLQGVTV---IEVR-----	1957
GLOBOSUM	SDFLADSLSDMSLFGQKARDARSLT-QSSIPLLSQ-DFSS--	1927
PALUSTRIS	PSDFLADSLSDIITLDRPSTLLA-N-ANGGPVYSA-PTQSS	1981
NEOCALLIMASTIX	FSSFLASLSDSVDFLGN-----DD-MD---FNN-Q---	2057
GLOMUS	ASQYLDSSVTOGGALKEL-----P-D---ESEGESKNEHSDTI	2111
LOBOSPOR	SDFYLSDSLSDSVGMILE-----SEVYT-D---LDDGTTNQGNDTP	2035
SYNCEPHALASTRUM	ASMLAGSLSDSLSLSDALAESGQVSS-MRTDEAVD-D---	2031
FUNCTIVORUM	LINFLADSLRELGLSFTFLGKISR-T-APFLEK-----	2000
HALBUM	SDFYLDLSDSLDVGSSSTT---ST-STTTTSTN-----	2143
DPURPUREUM	SDFYLDLSDSLDFISKPLEDEKDLNS-DQPTPT-----	2138
PIVOLACEUM	SDFYLDLSDSLDFISKPIEDEKVDV-SNNILIG-----	2135
AMPHIPOD	KSNYLDLSDSLDFSSALVSLG---EKTQHSK-----	2056
SHRIMP	ASHYLDLSDSLREDSDFDNNSVVLAMSG---TEKSSE-----	2037
MUDCRAB	ASHYLDLSDSLREDSDFDNNSVVLAMSG---REDNQY-----	2032
TARDIGRADE	SASLVQSSFLNEMERDYSEGLDRST-PL--AAR-----	2085
HYDRA	PSRFLMSLSLSEVMEFINKPKPYTN---NEEKSL-----	1983
SALPINGOEA	PSDFLADSLSDAAQLEALRQGDVGE-S-AVEDASSSSSSPSSDGP	1965
SPIDER	GSEHLESLSLAEDVNRVFTTNEQIFKP-BGKNEMLNS-----	2059
LIMULUS	ASQYLDLSDSLAEDVNRVFTTNEQIFKP-PIEHMARK-----	2052
SCORPION	PSDFLSDSLSDVNRVDFSSSELAFG-DMKARKARK-----	2039
ROTIFFER	SDFYLSLSELRELVDYFVHVSQYVNSQSSVTR-----	2042
CLIONA	---AFLAGSLREIIVDRNRSLVVNT-SSANISMSV--T-----	2060
OCTOPOUS	SSLYLENLSLVDIGRVDYLSNNAHQE-IASISEKEN-----	2015
CAPITELLA	ASQYLAGSLSLDVGDFGSSMVSSAD-S-SFDNQ-----	2064
LIMPET	SDFNIEEHLSDLNQDFNSGTAQVFF-S-DIFSD-----L-	2042
SCALLOP	ASQYLDLSDLHDVQDFSTAGTQFS-PSPSDKGKTR--LGRIF-----	2093
LINGULA	ASQYLDLSDLSDVAVDYSGLQGERS-E-PVPPRTQ-----	2065
OYSTER	ASQYLDLSDLHDLNQDFATATPQ--MS-E-GSPREKVL--TVRKS-----	2061
SNAIL	ASQYLDLSDLSDLREFTVSGAQNT-S-GIPKTKAS--LRKNS-----	2064
SPONGE	SDFYLDLSDSLSDVQDFTLPHHHQYG-SVGGGASTE---SSSID-----	2084
PRIAPULA	ASQYLDLSDLSDLREDFNVSTQIRER-GDPRAEKPP---EGEAEQ---	2086
DANTIO	SDFYLDLSDLSDVNRVDFSTGVQFSY-NQNPQSGVS-----	2072
ESHARK	SDFYLDLSDLSDVNRVDFSTGVQFSY-NQNPQSGVS-----	2072
BHARK	SDFYLDLSDLSDVNRVDFSTGVQFSY-NQNPQSGVS-----	2070
XENOPUS	SDFYLDLSDLSDVNRVDFSTGVQFSY-NQNPQSGVS-----	2083
STERLET	SDFYLDLSDLSDVNRVDFSTGVQFSY-NQNPQSGVS-----	2087
GAR	SDFYLDLSDLSDVNRVDFSTGVQFSY-NQNPQSGVS-----	2076
HUMAN	SLSYLDLSDLSEEMSDFTSGVQFSY-SGDPRTAT-----	2064
PLATYPUS	SLSSMADSLSEEMSDFTSGVQFSY-SGDVKSTG-----	2068
TASDEVIL	SLSYLDLSDLSEEMSDFTSGVQFSY-SGDKSKATV-----	2070
COELACANTH	SDFYLDLSDLSEEMSDFTSGVQFSY-SGDNRAAV-----	2075
CAECILIAN	SDFYLDLSDLSEEMSDFTSGVQFSY-SGDPATAQ-----	2077
CANARY	SSSYMDLSDLSEEMSDFTSGVQFSY-SGDVTAAS-----	2066
OSTRICH	SASYMDLSDLSEEMSDFTSGVQFSY-SGDVTAAS-----	2036
GECKO	SASYMDLSDLSEEMSDFTSGVQFSY-SGDVTAAS-----	2075
TURTLE	SASYMDLSDLSEEMSDFTSGVQFSY-SGDVTAAS-----	2075
ALLIGATOR	SASYMDLSDLSEEMSDFTSGVQFSY-SGDVTAAS-----	2033
APLYSIA	ASQYLDLSDLSDLNQDFNISSSAQGS-FSQDVKV-----G---SSVP---	2096
TRICHOPLAX	SDFYLDLSDLSEIEISDFNSSTVQVGS-ENNSIKQIP--TR-----	2055
SOFTCORAL	SDFYLDLSDLSEIEISDFSTPIALSG-SESTEQDIA---GGEN---SGTP---	2077
STONYCORAL	YSDFYLDLSDLSEIEISDFSSPIQVHSG-TEARQ--PL---YKL-----	2095
SEA_ANEMONE	SDFYLDLSDLSEIEISDFSTPVQVNI-NYLKRTGKP--DQ-----	2064
SEACUCLE	SDFYLDLSDLSEIEISDFSTPVQVNI-NYLKRTGKP--DQ-----	2075
LANCELET	MOSYLAGSLSEIEDIISDFSTGVQVHS-DFTSSVGER--YQASG---	2097
STARFISH	SDFYLDLSDLSEIEISDFSGGQVFNQ-SI-DKQSL--SSRSSVP--H---IK---	2114
SEA_URCHIN	SDFYLDLSDLSEIEISDFSSSVRHFGS-SM-E-SRQD--GSQSG---	2100

s2041 s2056

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----QSTVEVQKTEMOEVRKHLMIPLSLIDFMANK-Q	1959
TETRAHYMENA	-----LP---F-----GDQTGENLEMLDIRHPMPVTVLTIDKMQVQ--	2102
STYLONCCHIA	-----ML---DKSAADESEIQDVSQLELDNVNKHPCMKNIKRIDKMSL--	2089
APHANOMYCESa	-----PMANDEEDEDLEMDALNSHPMLPLKIKHMERLF-	1912
APHANOMYCESa	-----SNPTSEETEDEVLELDLIMMHPMIPLMQIKHMETLF-	1855
PYTHIUM	-----LVAREALYQGDIELELDSDHPCMIPLLRVLQMKTFD-	2033
PLASMOPARA	-----INRGASLYQDIELELDKINQHPMIPLLRVLQMKTFD-	2023
BREMIA	-----IDQAVANQNIIVKLDLNOHPMIPLLRVLQMKTFD-	2009
AEDDES	-----AEFEAALKQHRATVSLERKINDHVMATTICAVIQHMHEN-K	2094
MIDGE	-----QQRMEDEQRTMRLQLESTPINNHVMVSLVGVVNHMHKC-R	2040
BOMBUS	-----KHDSTDKKESMSLTFEMOELNHPCHASICGVLSHMIEEKI	1953
ANT	-----TNSDLSLRTHMATSALHSQDEKEMPTVLCVLRHTRKIF-	1992
WHIPWORM	-----SAAIFSVYKLPARSDVAHPMFSVSVIQCQVVEKFG	2023
TRICHIANELLA	-----TESANDKDVMKFYKTKLDLLOHPMOMAVNNINYM-DHMG	2039
BEEFLE	-----ESNELPVQSEIELELDLITHECMANVCGVIEHMFRA-G	1953
BARNACLE	-----AEGGRERSAPASLQLPADDLNEHECMACATVALGHLAER-V	1976
THRIP	-----ADAEKSVIMLENSLDHECMPTCVSIIIRHLVDC-G	1988
FLEA	-----TKVENFGTIYLETDFLNDHECMSIICGVIGHMVTK-G	1980
WHITETFLY	-----QVAAGSDINESACLEEMDVINEHECMPLTAVINMTKDA-Q	2047
TICK	-----QAPAKEPVSRKVMLEDDALNGHECMASVCAVLCRMADL-G	2014
TERMITE	-----LKPTEKSGAESTEVILESDDLNHPMATLCOVIEHMQVQ-G	2064
DAPHNIA	-----LPVSSPTISDASSVLYLDDLKHSCMSLLVFNLFNNFYAN-Q	1911
OSTREOCOCCUS	-----K-----ETETPAKGEPRDVLNHPMDGVFRILKLVTKST-G	1996
STENTOR	-----LVNNDDEEKSNVTEFADELNHPKPLDLELTERMELN-F	1823
KLEBSORMIIDIUM	SASMLPDAPSGVYBQCEPAAPADESSVTSALDELDKHPMAYLRLVLEHLKQK-Q	2220
CLUBMOSS	-----DENVEQAANEOTEHEHVEFVALDQDDFQHPMVGVLRLIDHLSR-F	1984
MOSS	-----ST---ETNIEATABQEEIETTTALDRDDFQHPMPVILRLAEHVVK-F	2104
LIVERWORT	-----VASGDKSVQENSSVDHMDVTIPDQDDFQHPMEVLKLERLHKS-F	2133
LIGNANO	-----R-KNRFHNQTLTATRNLIVLESDSVNDHPCMATWALLRHMKA-F-K	2211
COPEPOD	-----KDTPELVEPIYINIEBEDALGHPMAQLAVAEHMTAC-N	1997
GLOBOSUM	-----LS-LAAASAVNDASNALEMDLNEHCMSRGLSVIQRLS-K--	1966
PALUSTRIS	-----QGEVMNAS--PTGDQRSLIFDHNHCMSRIVLVKKNLNAV--	2020
NEOCALLIMASTIX	-----N--KNEI--KKNYEYNETFFDKCVNDHICMPTILKIKKISNN-S	2098
GLOMUS	-----PME-IDERVENKSKLELEIDVNSHPMKNMIRVDRLSHQ-L	2152
LOBOSPOR	-----ELSGPNPNAVSEVKEEHEHMLLDALNSHPMKNMLLVINELHST-I	2083
SYNCEPHALASTRUM	-----EP-----GEVSGRGENLEMDVFNKHPMPFVOTIKRLHST-I	2069
FUNCTIVORUM	-----M-----QNPVAVDVSFAKEVLELDLNOHPKMSMLLDLDBMYKL-F	2043
HALBUM	-----N--NNLKIVASAMNMPLELDKINSHPMOPMLKIIDYQER-F	2183
DUPURPUREUM	-----PVSTSPHIHQSDIRIDQVNSHPMIAMLKIIDFYQNK-F	2176
PVIOLACEUM	-----Q--KNNSITVNEIDTDIRIDQINSHPMIALKIIDYQLK-F	2175
AMPHIPOD	-----PRDITTEGTLPMPTLETDFNSHVMPELTAVLHHIHR---	2093
SHRIMP	-----RVTGANEMGGVLPVHMDSYNGHEVMANLTAVINHMVDA-E	2079
MUDCRAB	-----RIASNDTEGELLRMNFQSDYNGHEVMANLTAVIYHMVDA-K	2074
TARDIGRADE	-----EDAMGTIELEMDALNOHEMAYLVGLVQHMVEK-K	2119
HYDRA	-----NEE-----ESVESFLELDLNOHECMSKYISLINHMKNK-N	2018
SALPINGOCEA	-----EDS--PGAPSNIPVYVVEDSQHEMDELNSHESMVSMLGIQRIQAV-H	2099
SPIDER	-----MSS--KN-----TYVADYLELD-DLNLNOHMSMLSLIRSMKNK-S	2097
LIMULUS	-----YSS--NPEQERQVIMVNDYIELEMDLDRHECMASLTALLQTMQK-G	2097
SCORPION	-----SNP--SNEAKDDLVSNITVLELDLNOHECMSLTMELVQHEKLI-Q	2084
ROTIFFER	-----SFR--RKYTDDLELNSQSVLELELDLNOHSMNDLISLFGQSLVM-K	2087
CLONIA	-----ENT--DSOPAIATFSGNPEVLEHVSLEHECMPLAVGLITHMHEN-N	2105
OCTOPOUS	-----SA--NSSALISEE--KIIDYALEMDLNOHECMPLVAVLKHMYQK-N	2057
CAPITELLA	-----E--SSIEVPDVVLKEHYIEMEMALNOHPMAALSALLQHMKNL-Q	2107
LIMPET	-----TSS--SNVQPDQFNTVDYIELELDLNOHECMATWALLKHLHT---	2085
SCALLOP	-----NDP--DDTETKVVVDDYVLELDLNOHECMATLIALLOHMERAG	2138
LINGULA	-----R--AVSEEAAPAEADYEEIEMDELNOHECMATMALLKHMQRN-K	2108
OYSTER	-----TDE--EDDTEKVMVEDDYVLELDLNOHECMANMIALKHMQRN-K	2106
SNAIL	-----GGDNKVRLDGDYVLELDLNOHECMAPLVALLKHIIKRN-K	2104
SPONGE	-----DSG--NSQEASSYVV--SEEQLEDDLNEHMTPLMKLIDHMIIN-K	2127
PRIAPULA	-----MDV--NEEESGATLAGDYVEMDELNOHECMASVVALINHLATT-V	2131
DANTIO	-----SSR--MRER--KEVLSQDETVELEMDLNOHECMANMTALLRHMQRN-N	2116
ESHARK	-----RSR--RKEQAEVLSQSDIMELEMDLNOHECMANMTALLRHMQRN-N	2117
BSHARK	-----RFR--KTEWTESNIMDLNIVLEMDLNOHECMATWTALLKHMQRN-N	2115
XENOPUS	-----ASR--KKEQITTEGKTFDDVMEFEMDELNOHECMAMTGLIKHMNRS-E	2128
STERLET	-----RGR--RRER--VESLVQDDVLEMDLNOHECMASMTALLRHMQRN-N	2131
GAR	-----PSR--RRDG--AEAALQDDVVLEMDLNOHECMASMTVLLNHMQRN-N	2120
HUMAN	-----RFR--RREQ--RDPVTVDVLEMDLNOHECMAPLVALKHMQRN-L	2108
PLATYPUS	-----HFK--RREY--RDPVTQSDVLEMDLNOHECMATMTALLKHMQRN-Q	2112
TASDEVIL	-----HFR--RRER--IDSMVQDDVLEMDLNOHECMATMTALLKHMQRN-H	2114
COELACANTH	-----HSR--RKER--TESVQDDVMEFEMDELNOHECMAMTGLIKHMQRN-K	2119
CAECILIAN	-----HSR--KREH--PEFTVQEDVMEFEMDELNOHECMAMTGLIKHMQRN-Q	2121
CANARY	-----RFR--RKEP--TEYKVLNDEMELMEDEFNOHECMASMTSLIKHMERN-Q	2110
OSTRICH	-----RFR--RKEP--TEYKVLNDEMELMEDEFNOHECMASMTSLIKHMERN-Q	2080
GECKO	-----HFR--RKEP--TESMGLDIMELEMDLNOHECMASMTSLIKHMERN-N	2119
TURTLE	-----HFR--RKEP--TESMPODIMELEMDLNOHECMASMTSLIKHMERN-Q	2119
ALLIGATOR	-----RFR--RKES--TESMVLDEMELEMDLNOHECMATMTALLKHMQRN-Q	2077
APLYSIA	-----GS--EESQSEPGVSGDYMELEMDLNOHECMAPLIALRHMVAT-K	2140
TRICHOPLAX	-----ETG--DSEKAKTIINKFADELELDLNOHECMALTLVLLDHMAVN-K	2100
SOFTCORAL	-----AS--PKE--SDSDISS--EELMDELNRHOCMTTLVGLINHLVKN-K	2117
STONYCORAL	-----SSS--TAEQTDWYEVSE-DTLEMDLNRHOCMAKMSLLKHLVDK-K	2139
SEA ANEMONE	-----LGEDSYEIGE--DVEMDLNSHCLTKICSLTHMKES-N	2101
SEA CUCUR	-----MNQ--TEVAGQEEELGDYLEMDELNOHECMASVAVLQHMERN-K	2120
LANCELET	-----LQA--RQQQSSSVNIHGDFLEIEMDELNOHECMSSMAVILQHMARN-N	2142
STARFISH	-----KRY--SNETPTVVVQGEYIEMSDALNOHECMASLTAVLKHMQAN-K	2159
SEA URCHIN	-----MAS--RQDSKPVFSPGGEYLEMDELNOHECMAMTGLIKHMNTN-K	2145

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	NFQQQIAGQ---QQTQQTQQEEEMPSMTALIKQVF-ND-----DS--LYL	2005
TETRAHYMENA	-----FP---LTRAMPQMNLLLEEV-KK-----DS--CSL	2133
STYLNONCHIA	-----FKREWDQNTNEMPKFMNLCLEI-KR-----PD--IHLNFKI	2125
APHANOMYCEsa	QSQ-----WTDAMPQMDKWFVNL-S-----TN--SSTSVRL	1944
APHANOMYCEse	HSQ-----WSNTAMPQMEKWFVNL-S-----SH--SSTAVRI	1887
PYTHIUM	ADS-----WDGKTMQMKQIFNVY-AD-----ST--TEVGVRL	2066
PLASMAPORA	GSN-----WNAKVMQKQIFDVI-VD-----LS--TGLNIRL	2056
BREMIA	GSS-----WSTNSMPPMKKIFNVI-VE-----AS--TGLNVRFL	2042
AEDDES	ITPVVEG-A-----R--ATPPPVKFLAASL-RD-----QQ--QHKVRL	2130
MIDGE	ITPFDVF-E-----KCDEKFEVYLSLAEPL-RS-----RN--VHKVVRM	2078
BOMBUS	SVPPFDD-----TTTVPKMLCKFLSS-PT-----TT--NYNVVRL	1987
ANT	-----RL-----SDKPELRLLEIM-QC-----D--AQVHQL	2020
WHIPWORM	NIGA-----E-KGSMPRMLFMKDFM-QF-----GSINVKI	2054
TRICHINELLA	MIPY-----EAGTPLPAMMASMRDFL-NF-----GSINVRFL	2071
BEEBLE	ISEFPDE-----EEQYLPANLQAIRTL-LD-----EN--TAVNVKI	1990
BARNACLE	-WPLPEV-----GPPAQAPVVTALCARL-QS-----DN--TPDNVLL	2012
THRIP	ISPAPVQ-----GAKPTLPEWMDLKNL-TD-----LS--NPRNSQI	2025
FLA	ISPLAQSSINHGINTKQSSVPMPSMEALVQVL-AN-----AE--TPVNI	2030
WHITEFLY	LIQPPPE-I-----IGSSDLPMIKPIHQAL-IN-----QN--VHKNI	2085
TICK	IIPQTADDE-----VNIQPAKMLTFLTNAT-VG-----NH--TTRNLC	2053
TERMITE	ISPTPDA-E-----TKDAALPPVMSMRKCL-SD-----YS--QPRNIRL	2102
DAPHNIA	TL-----LANSPPKMITLREAL-LN-----PN--AHNVVRL	1942
OSTREOCOCCUS	LTTGG-----NSELPPSIQLLEAII-SLL-----YTPP--ILPAVLV	2032
STENTOR	A-----DSQEMQWQCLHSDI-SN-----NS--NFLAIRL	1853
KLEBSORMIIDIUM	GA-----E-PAEMPPMDAHHKSL-TS-----PA--TPIVRL	2252
CLUBMOSS	GST-----S-SQOMPEMKSIHATL-ES-----SS--THANVRL	2016
MOSS	GAN-----YQPGVMDNPKSLHATL-DN-----AA--THINVRL	2137
LIVERWORT	GSG-----N--REMPEMKALHSTL-QN-----AG--THINIRL	2164
LIGNANO	LIPQLEGG-----VKPTQMPKMNMLQKV-SN-----SSTDSPVRI	2251
COPEPOD	IYSTPTEN-----FSNPTLPSMQSIHVDL-V-----EGSTPRVRL	2035
GLOBOSUM	--PGA-----DOEMLWMLKSLHGKM-EK-----PD--AHINVR	1997
PALUSTRIS	--PNT-----DGRPTVMQELKKM-SE-----TD--TPLNVR	2051
NEOCALLIMASTIX	MKAPTQ-----ETTPAVMNAILKTF-TSY-----A--THINVKI	2132
GLOMUS	TKPVDP-----VESMPGMMNDIYKFF-TNIGENKEND--THINIRL	2193
LOBOSPOR	TPPPKEMA-----KESAMPKMKDTHRKL-VN-----PN--TNLVR	2121
SYNCEPHALASTRUM	SPDP-----TKTTPAVMNTLLSTP-KKAEN--ND--SGLFLR	2105
FUNCTIVORUM	QQ-----DFSKVEKFMQEHKSL-SG-----KD--SPPHLL	2075
HALBUM	RESI-----DQSPNDMPKMNELYLKKN-DN-----TN--LHPNLL	2219
DPURPUREUM	VIPPTQGLFAQ-----QTQHKLTPSDMPKMYEIQKL-Q-----QG--VHPNIV	2221
PVIOLACEUM	VSTTPT-----IGEPQLSDMPKMTIYNKI-ND-----SD--LHPNII	2214
AMPHIPOD	-----LTE-----D--KSQSSPPLMTEILKEL-SN-----SK--APRNVRL	2127
SHRIMP	IMVLHGGDT-----V--PKATDVPQMTLVQQL-DS-----AD--TPRNVRL	2119
MUDCRAB	IMMLHKEDS-----T--PSAAETPPMTIQQKL-ES-----GE--THRNVRL	2114
TARDIGRADE	ITPTVKDP-----LDNPSPPAIIISALAGEL-KS-----ST--AHLNVRL	2157
HYDRA	IYIQPNK-----EVKDMPPMTYFHGKI-TN-----KD--TEFNVV	2055
SALPINGOBECA	AESKPORNE-----DGLILPSSTMPMSNLLKSP-ES-----TS--TSHNVR	2142
SPIDER	FISDEK-----AGAPPAMLSATVQSL-ED-----RK--SSDNVRL	2131
LIMULUS	I1AATD-Q-----KSTTPVPKFLEGLCKL-NN-----SE--VHKVRL	2134
SCORPION	LLSS-----SPKEEKLDMCKKL-ED-----YG--VIRNIRL	2117
ROTIFFER	ITPIYDNG-----QLSPMPMTYVHKKL-LD-----VY--THEVRL	2125
CIONA	IGFPEEK-----EESSLRSMSSIHKKL-SG-----SS--TSKNVRL	2143
OCTOPUS	ITPKPE-----NKEMPPMNYLRKPK-IA-----SS--THLNIRL	2090
CAPITELLA	ITPEVEKG-----SKPSSMPDMKNIHDKI-KN-----SD--TQLNIRL	2145
LIMPET	VITPVLKG-----TIPKEMPTMSYFSEKM-TN-----PA--TSFNIRL	2123
SCALLOP	VTPPVVTG-----TAATMPGMDYLHTKI-KS-----AK--THVNVRL	2175
LINGULA	ITPDVSN-----PLDVPVMKYLRDKM-NS-----TT--THINVR	2144
OYSTER	I1PLVESG-----VVPELPAVMKNLNDKI-RS-----PR--THNNIR	2143
SNAIL	IFPAAQSD-----ASSQDMQVMVFLHDKM-TK-----NTGSDTLNIRL	2144
SPONGE	ITPAPSGD-----SPEMPPMTPLHKRM-TD-----SR--TGRNIRL	2163
PRIAPULA	C--PIQAA-----SSPAHMPAMMELHGGK-SH-----VE--TPLNVR	2167
DANTIO	ITPKVEEG-----VRPSDLPPMKFLQKGL-DN-----PS--TPLNIRL	2154
ESHARK	ITPQVEEG-----KTPQELPPMKFLHGKL-GN-----SG--IPLNIRL	2155
BHARK	ITPKVEEG-----KTPHELPPMKFLHGKL-GN-----SA--TPLNIRL	2153
XENOPUS	ITPKVDED-----ASPQELPSMKFLHVKL-GN-----TS--TPLNIRL	2166
STERLET	ITPKVDEG-----TVPADLPPMKFVHGKFL-GN-----AS--THLNIRL	2169
GAR	ITPEVEEG-----TVPSDLPPMKFLQKGL-GN-----PS--TQLNIRL	2158
HUMAN	GPPQGEED-----SVPRDLPSMKFLHGKL-GN-----PI--VPLNIRL	2146
PLATYPUS	ITPKVEEG-----SGSTNLPPMKFLHGKL-AN-----PL--GALNIRL	2150
TASDEVIL	ITPHVKEG-----SEPPSLPPMKFLHNKL-EN-----PS--TPLNIRL	2152
COELACANTH	ITPQVEEE-----SGPVELPPMKFLSHKL-AN-----PA--TPLNIRL	2157
CAECILIAN	ITPKVEEG-----TVPQDLPPMKFLHGKL-GN-----TS--TPLNIRL	2159
CANARY	ITPKVEEG-----TVPADLPPMKFLHGKL-GN-----PS--VPLNIRL	2148
OSTRICH	ITPKVEEG-----TVPVLDLPPMKFLHGKL-GN-----PS--VPLNIRL	2118
GECKO	ITPTVEEG-----AVLPDLPPMKFLHGKL-GN-----PS--VPLNIRL	2157
TURTLE	ITPKVDEG-----TVPRDLPPMKFLHGKL-GN-----PS--MPLNIRL	2157
ALLIGATOR	ITPQVDEG-----AVSVALPPMKFLHSGKL-GN-----PS--VPLNIRL	2115
APLYSIA	ISPPEPTAG-----APAKEMPMMPYLHDKM-SS-----PS--SHVNIRL	2178
TRICHOPLAX	INPAIEKD-----TTPSEMPMSVVALRKA-SD-----HT--TNRNIRL	2138
SOFTCORAL	ISPQEQG-----KEANEMPPMSYLHKKI-SH-----HS--SELNVR	2155
STONYCORAL	ISPQVQK-----VPPTDMPAMAPLHKKI-AS-----SS--THLNIRL	2177
SEA ANEMONE	ISPQPDKG-----ALPKDMPSMSALHKKI-TN-----FE--THLNIRL	2139
SEACUCU	ITPEVTOA-----KQSSNMPPMKMLHGKM-SS-----SE--TSVNIRL	2158
LANCELET	ITPQVQK-----AAPKDMPPMSCLNKKL-GG-----SS--THKNVRL	2180
STARFISH	ITPEIPEG-----SKASEMPPMSLQKKL-TS-----QS--THVNIRL	2197
SEA_URCHIN	INPDITKA-----TKAEMPMMSGLQKKL-SS-----QS--TEHNIRL	2183

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	LKLIIN-KSD	IFNRYASGWIGVLL	2028
TETRAHYMENA	LKIVLN-KPL	LFKESYQQWFDVLV	2156
STYLNCHIA	LKLIIN-HPO	LFSAYAKWFEPVIA	2148
APHANOMYCEsa	CKVVLN-RPM	LFAPYAAKFGVPLV	1967
APHANOMYCEsa	CKLVVN-RPG	IFEPYAAKFGVPIV	1910
PYTHIUM	VKIVLN-VPD	VFAYADKWAEKLM	2089
PLASMOPARA	AKVVLN-VPS	VFSTYSLWLPVAVM	2079
BREMIA	AKVVLN-VPD	VFPLYSESWLRAVI	2065
AEDES	AKVIDN-CRT	WLKPYAATLIPPLM	2153
MIDGE	AKLIEB-CRD	VFVYAKFLLGPPVM	2101
BOMBUS	LKIIIN-MQT	VFQPYAKFFLQPIM	2010
ANT	LKIIEHFADE	VFKPYARFALQII	2044
WHIPWORM	ARLLIN-LEQ	IFLPCYEWFDVVA	2077
TRICHINELLA	ARIIVD-CPH	VFRPPYLEWISPII	2094
BEEBLE	VKVIDN-TIH	IFKHPKSKYPTPELL	2013
BARNACLE	CRLLIN-CDS	ACRPYGRWLLPPLL	2035
THRIP	LRVILN-CEV	YFSTYAMVMEPML	2048
FLEA	MRIIDN-CQI	VFRPYAHHILTPIL	2053
WHITEFLY	CKLILN-VSE	VFAPYASHFILSIS	2108
TICK	CRVVVN-SAE	VLRVHSRHLVPALL	2076
TERMITE	LKIIIN-VES	KFHPYAHHMNSIL	2125
DAPHNIA	IRLVVN-LKS	IFRIYANFWYKALL	1965
OSTREOCOCCUS	VKALLR-LNHELASDSDSDISMHSVCTSPSLLA	ANPDVMSLLTATI	2078
STENTOR	VKIIIN-RPQ	SFKKWAIDLWGPIC	1876
KLEBSORMIDIUM	AKIIVN-ARK	LFQPFKREWPAPLI	2275
CLUBMOSS	CKVVVK-ARK	VFARPSDTFFQPLV	2039
MOSS	AKVITK-TRK	IFAPHAADWIRPVV	2160
LIVERWORT	TKVVVR-TWR	VFAPFAQVWFIPVV	2187
LIGNANO	MKLLIN-CQD	IFQPYAHFWLRPMC	2274
COPEPOD	LKFIYN-CSE	IFLPCINWYTPIL	2058
GLOBOSUM	AKIILN-VPN	IFAPFAKYWWRPIA	2020
PALUSTRIS	AAIVMN-VPE	AFSANAGEWWRCPA	2074
NEOCALLIMASTIX	AKLIMN-YSD	PFIPVNSWYIPLV	2155
GLOMUS	AKIIVN-VPE	AFEKYASLWIRPVI	2216
LOBOSPOR	AKIVIN-IPB	AFEMYAHSWIRSLM	2144
SYNCEPHALASTRUM	AKVILN-LPA	AFEPYADFWIRPIM	2128
FUNCTIONORUM	LKIIIN-RPL	YFKAYSYSWIGALI	2098
HALBUM	LKVIIN-RQO	YFRYHQRWTPILI	2242
DPURPUREUM	LKIIIN-RPS	YFERPHELWIPILM	2244
PVIOLACEUM	LKIIIN-RPQ	YFERFYKYWVPILL	2237
AMPHIPOD	LRLLTN-TAQ	LFAPYARHASRAVL	2150
SHRIMP	LRVMMN-NAR	IFEPYAAHFVSTIL	2142
MUDCRAB	LRMMN-TSR	VFAPYAVHINPVL	2137
TARDIGRADE	AKLIMN-VENVSSETETPSSGGGNPPGTEEPGPPGTEEPDPTLPYFYQAEFLYGPILL		2216
HYDRA	ARIVIN-EPK	LFQPYAQFWFLPII	2078
SALPINGOECA	AKLITN-MPD	AFQPVSSRWLRPIM	2165
SPIDER	ARFIVN-NAE	LFQPYAEFLMGPIL	2154
LIMULUS	ARLVVN-NAQ	IFQPYAGSLLDPLI	2157
SCORPION	AKLFIN-NAE	IFKPYAVFLLQPLI	2140
ROTIFFER	IRAIIN-TES	IFKPYCKFWISALI	2148
CIONA	AKLIIIN-CEQ	YFRPYAHHITPILA	2166
OCTOPUS	AKLIVN-TAE	IFEKYASFVWLPLS	2113
CAPITELLA	AKVILN-GES	VFRPYASFVWQPLV	2168
LIMPET	ARLIFN-TSE	VFQPYTKFWLRPLC	2146
SCALLOP	AKLVSN-CTQ	IFQPYARYWLRPLS	2198
LINGULA	AKLILN-AEE	VFAPYAKFWLGPLV	2167
OYSTER	AKLITN-TAE	IFRPPYARDWIRPLT	2166
SNAIL	AKLITN-TSE	IFQPFARLWLRPLC	2167
SPONGE	VRLITN-RPK	IFQPYAKHWLPVLT	2186
PRIAPULA	ARLVVN-CAH	AFRPPCAASWLAAPLM	2190
DANTIO	AKLITN-TEE	IFRPPYAKHWLGPLM	2177
ESHARK	AKLIVN-SEE	VFRPYAKHWLGPLL	2178
BHARK	AKLIVN-TEE	IFQPYAKHWLGPLL	2176
XENOPUS	AKLIVN-TEE	VFRPYARFWIGPIL	2189
STERLET	AKLITN-TEE	VFRPYARHWLGPLL	2192
GAR	AKLIVN-KEE	VFRPYAKHWLWPLL	2181
HUMAN	AKLIVN-TEE	VFRPYAKHWLSPLL	2169
PLATYPUS	AKLIAN-TEE	VFRPYARHWLGPLL	2173
TASDEVIL	AKLITN-TEE	VFRPYAKHWLNPPL	2175
COELACANTH	AKLIVN-TEE	VFRPYAKHWLGPPF	2180
CAECILIAN	AKLIAN-TED	VFRPYAKQWLGPLL	2182
CANARY	AKLIVN-TED	VFRPYAKHWLGPLL	2171
OSTRICH	AKLIAN-TED	VFRPYAKQWLGPLL	2141
GECKO	AKLIVN-TEE	VFQPYAKQFLGPLL	2180
TURTLE	AKLIVN-TEE	VFRPYAKQWLGPLL	2180
ALLIGATOR	AKLIVN-TEE	VFRPYARHWLGPLL	2138
APLYSIA	AKLIVN-CTK	VFQPYAKFWLRPFC	2201
TRICHOPLAX	AKLITN-RPK	IFRPPYAKFWLVPIL	2161
SOFTCORAL	AKLITN-LPE	VFEPPYAKFWLDSLM	2178
STONYCORAL	AKLITN-EAK	IFEAHAKFWFNPLM	2200
SEA ANEMONE	AKVILN-OSQ	VFEPPYARFWLSPML	2162
SEACUKE	ARLIVN-CSK	VFEPPYAKFWLNPLI	2181
LANCELET	AKLIVN-NEE	VFRPYARFWLSPML	2203
STARFISH	ARLITN-NNE	VFTPYARFWLSGLL	2220
SEA_URCHIN	ARLVVN-AQD	VFQPYARFWLSPML	2206

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	DYC	-----TK--ENKIN	---G-GK-GPHYFLR	--DVIVVLI	-K	SQK	2060	
TETRAHYMENA	DYA	-----KL--	---NDN	---G-SK-FPHYFLR	--DVVTELI	-D	CCKS	2186
STYLNONCHIA	NYL	-----CD--KNN	---G-GK-GPHYFMR	--DLCLLLI	-S	NYI	2178	
APHANOMYCESa	ELM	-----LL--V	---PK-RD-EPHYLLR	--DVCHVVVD	T	NOV	1996	
APHANOMYCESa	ELI	-----VE--V	---PK-LD-EPHYILR	--DICHVVVD	T	WHL	1939	
PHYTIUM	EVI	-----IE--	---ATMVSSDK-KA-EFNYMIR	--DCCHLADEN	K	KNV	2125	
PLASMOPARA	KAL	-----LD--V	---SAVQK-VS-EFNYILR	--DCCLVLVLS	K	KDV	2112	
BREMIA	ETL	-----LD--V	---NAAQM-AP-EFNYILR	--DCCLVLVLS	K	QNV	2098	
AEDES	QVI	-----VD--ECI	---AP-QLNFFVT	--DLIALIL	-E	GDQ	2182	
MIDGE	SVI	-----AD--KCC	---GL-KMFFIT	--DLVFMLL	-S	WSP	2129	
BOMBUS	HAT	-----IS--YLK	---RN-QLMFFIV	--DVIEMLI	-D	QTS	2039	
ANT	KTV	-----FK--YLO	---RH-NMFFIT	--DIEILM	-D	YDV	2073	
WHIPWORM	QLV	-----LN--DQL	---AEAGLNFYFR	--DLLLILL	-Q	IAE	2107	
TRICHINELLA	KLI	-----VM--DEF	---GSNILNFYFRV	--DLNVLF	-E	TAH	2124	
BEEBLE	KFI	-----VD--RSA	---GE-VMNFVA	--DVVAVL	-T	CTE	2042	
BARNACLE	RLI	-----AA--ERL	---GP-EVNALLL	--DVLMLA	-G	AAQ	2064	
THRIP	DCV	-----LR--ICL	---QN-GISYLLG	--DLVMLA	-K	NAE	2077	
FLEA	ELL	-----VD--ECA	---GS-TINHFVA	--DTVALML	-S	HDV	2082	
WHITEFLY	EAI	-----AA--KCF	---GS-EINHFVA	--DLVLMML	-S	WKI	2137	
TICK	NVL	-----AG--DKL	---GS-ELDAFVI	--DVAVTVL	-M	ASD	2105	
TERMITE	KAI	-----TD--GVV	---GR-APNLLS	--DTVAMLA	-L	D	2150	
DAPHNIA	VAL	-----LR--KI	---G-GE-PLNLFVR	--EALDML	-E	SNE	1994	
OSTREOCOCCLUS	ELV	-----S--KES	---G-VD-NVSPRETTD	--VAVL	-E	CNDLSK	2110	
STENTOR	TVM	-----S--GNN	---G-GT-GLNFYFR	--DCHLFL	-D	DMI	1906	
KLEBSORMIDIUM	EIF	-----TA--DPSRS	---G-GK-SMFFLR	--DVCVFFL	-Q	DLA	2307	
CLUBMOSS	NVI	-----LH--DPPPT	---G-GF-SPHYVLR	--DISIIL	-Q	DVK	2071	
MOSS	QTI	-----LI--DPRKS	---G-GL-KPHYMLR	--DICVHIL	-Q	NVA	2192	
LIVERWORT	QTI	-----LI--DPEKS	---G-GM-APHYMLR	--DICVHIL	-Q	NLP	2219	
LIGNANO	QFA	-----LS--DRN	---G-GQ-GPHYLLV	--DIVYFV	-A	NSGT	2304	
COPEPOD	ECI	-----VD--GTL	---SPEG-KLNYLL	--DLLMML	-Y	SEK	2089	
GLOBOSUM	QLV	-----QD--ADL	---F-GS-GINFFVQ	--DLCLLLM	-E	TKN	2050	
PALUSTRIS	ELI	-----TV--HTQ	---F-SK-GVNFVQ	--DLCLLL	-K	GGR	2104	
NEOCALLIMASTIX	KFI	-----SS--GEN	---F-ND-GFYFIE	--DICLLI	-K	KNF	2185	
GLOMUS	KLI	-----IE--GRS	---Y-GE-GINFFIQ	--DLCAIVT	-V	GSF	2246	
LOBOSPOR	KLA	-----IE--GEQ	---Y-GE-AMNFVQ	--DLCVLIV	-V	SGS	2174	
SYNCEPHALASTRUM	RLV	-----TQ--GAK	---Y-GD-PMNFVQ	--DLCYLIL	-A	GKN	2158	
FUNCTIVORUM	QAL	-----HST--	---G-K-TMCMR	--DICLLI	-E	MVK	2143	
HALBUM	EYV	-----IS--NOT	---G-GQ-GHYFIR	--DIAMLLI	-S	PNI	2272	
DPURPUREUM	DYI	-----VS--ENN	---G-GQ-GLNFYFR	--DVCFILL	-K	PNI	2274	
PVIOLACEUM	DYV	-----VS--KNT	---G-GS-GPHYFIR	--DVCLILL	-S	PNI	2267	
AMPHIPOD	QCI	-----TD--GTT	---GV-GFNYFLA	--DLVVLV	-G	GVD	2179	
SHRIMP	TCL	-----VD--GTI	---GD-KINFFFC	--DVMVMV	-G	GSK	2171	
MUDCRAB	TCL	-----VD--GTT	---GD-RINFFFS	--DLVVMV	-G	GKR	2166	
TARDIGRADE	DLI	-----ME--IDC	---TE-GMNFVAV	--DLIHLL	-K	SVK	2245	
HYDRA	ELL	-----LS--QRT	---L-GD-YNFFV	--GLIETML	-S	WSP	2107	
SALPINGOECA	LLI	-----LKPDDEPE	---TP-GFNFVT	--DLCLLL	-T	ADT	2197	
SPIDER	NLI	-----VI--GTA	---GF-SLNFYFL	--DVIHITL	-S	ASV	2183	
LIMULUS	QLV	-----VS--GTL	---GQ-EINFFIL	--DVLVLLM	-T	ATV	2186	
SCORPION	NLI	-----LN--ATP	---GR-EINFFIL	--DMLVLL	-S	SSI	2169	
ROTIFER	GFL	-----VNSSLCRD	---LA-QMCFIL	--DMVLL	-S	SSI	2180	
CIONA	QLI	-----LR--EDC	---G-VN-GIDFNC	--DLIVTVL	-S	NNI	2196	
OCTOPUS	EFI	-----IL--GNF	---E-EK-GINFFVL	--DIIVMIL	-S	GHE	2143	
CAPITELLA	ALA	-----TN--	---MG-GLNFYFL	--DIIVLL	-S	HEI	2194	
LIMPET	QLI	-----FS--GPL	---S-SD-GINFFV	--DLIVMM	-S	HHT	2176	
SCALLOP	QLI	-----LS--GAL	---G-SQ-GINFFV	--DVVMM	-S	HKM	2228	
LINGULA	QLM	-----VR--D-M	---P-DE-GLNFYV	--DMVTVL	-S	SSV	2196	
OYSTER	QLI	-----IS--GLF	---T-GLNFYVI	--DVIVTIM	-S	HQV	2194	
SNAIL	QLI	-----LS--TSL	---C-DN-GINFFIM	--DLLVIML	-S	HST	2197	
SPONGE	QFI	-----LSGDSTAGMGGAVGGGEN	---GLDFYV	--DAIATML	-S	SST	2226	
PRIAPULA	HLV	-----VN--GNC	---GVAA-AIHFLA	--DVVVML	-S	TPV	2221	
DANTO	QLV	-----VS--SSN	---G-GE-GIFMVV	--DIVTVL	-S	ASV	2207	
ESHARK	QLV	-----VS--GNN	---G-GD-GIFMVV	--DIVTVL	-S	TSV	2208	
BHARK	QLV	-----VS--GNN	---G-GD-GIFMVV	--DIVTVL	-S	ISV	2206	
XENOPUS	QLI	-----VS--GNN	---G-GT-GIFMVV	--EIVHIL	-S	SSI	2219	
STERLET	QLV	-----VS--GNN	---G-GE-GIFMVV	--EIVTVL	-S	TSL	2222	
GAR	QLV	-----VS--GNN	---G-GE-GIFMVV	--EIVTVL	-S	ASV	2211	
HUMAN	QLA	-----AS--ENN	---G-GE-GIFMVV	--EIVATIL	-S	TGL	2199	
PLATYPUS	QLV	-----VS--GEN	---G-GE-GIFMVV	--EIVATIL	-S	TSI	2203	
TASDEVIL	QLV	-----VS--ENN	---G-GE-GIFMVV	--EIVVVV	-S	TSI	2205	
COELACANTH	QLV	-----VS--GNN	---G-GE-GIFMVV	--DIVTVL	-S	ANI	2210	
CAECILIAN	QLV	-----VS--GNN	---G-GD-GIFMVV	--EIVTVL	-S	ANV	2212	
CANARY	QLV	-----VS--GNN	---G-GE-GIFMVV	--EIVHIL	-S	TSV	2201	
OSTRICH	QLV	-----VS--GNN	---G-GE-GIFMVV	--EIVHIL	-S	TSV	2171	
GECKO	QLI	-----VS--GDN	---G-GE-GIFMVV	--EIVHIL	-S	TSI	2210	
TURTLE	QLV	-----VS--RDN	---G-GE-GIFMVV	--EIVHIL	-S	TSV	2210	
ALLIGATOR	QLV	-----VS--RDN	---G-GE-GIFMVV	--EIVHIL	-S	TSV	2168	
APLYSIA	QLL	-----FS--PEV	---S-GS-GVNFVAV	--DLIVTMV	-S	HTV	2231	
TRICHOPLAX	QLI	-----VE--GK	---E-SD-GINFFIV	--DLMIILL	-S	ADV	2190	
SOFTCORAL	ELI	-----LL--PTF	---K-NS-ELNFYVI	--DIVVIML	-S	SSV	2208	
STONYCORAL	ELI	-----LQIKDTEPA	---G-TE-GINFFIV	--DLVVILL	-S	STT	2234	
SEA ANEMONE	ELI	-----LKLIEEAGE	---N-KR-GLNFYV	--DLLVHIL	-S	HAT	2196	
SEAUCUE	QLI	-----IG--GEI	---S-SP-GIFMYLL	--DIMVFL	-G	SEK	2211	
LANCELET	EMI	-----VR--GEA	---S-GE-GINFFIV	--DLLVIML	-S	GPV	2233	
STARFISH	QLL	-----IS--GNT	---G-GE-GIFMVV	--DVVVVLL	-G	VTV	2250	
SEA_URCHIN	QFL	-----AG--GOQ	---G--G--GINMYV	--DIMLVML	-D	STL	2234	

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	LEVRO-----EYLQMHPOSRNKIC-SVIV-NNLIIML-----SADKN-RKIFDQIET	2103
TETRAHYMENA	KPNLV-----TRR-IASDKKQNLK-QVI-NKICRV-----LAHKE-KEIFKONIQI	2228
STYLNONCHIA	PEDNT-----KNR-----LLCTNVV-NLILKY-----SADKT-KMIFNTNIEI	2214
APHANOMYCEsa	--DTI-----SD-----DLSRFV-NHLMV-----SPHPS--FILLRDLNLYL	2028
APHANOMYCEsa	--ETI-----DY-----DLSQFV-KHLIAV-----SPNTS-AAILRDLNLYL	1971
PYTHIUM	SVGSC-----SM-----MASRFV-NHLINL-----SPNEES-FIMRDLNIRA	2160
PLASMOPARA	VVSSL-----DT-----TTSRFV-NLIVKL-----CPDRN-ILVRSNVLL	2146
BREMIA	AVTFP-----ID-----TASQFV-NELIHL-----CPNRN-KLVQNNVLL	2132
AEDES	SYQPA-----SV-----DEI-SLASGLV-KFVMRN-----CYHAR-REVFRLNLEL	2220
MIDGE	VYKPT-----TM-----SEK-EDACFIM-KFLMEN-----AYNER--BEIFRLNLEL	2167
BOMBUS	SQRLL-----ES-TP-GQNK-DEIQQLM-ETLQKRVIVTKTEKIS--KSIYHYMMNM	2085
ANT	AVPSS-----E-----DGK-ARARQLF-EVLNKMVLMKSD--N-HRVDKMLGL	2112
WHIPWORM	GACQP-----SK-----PSSK-ALCGRLL-EYTIKY-----SGSKN-VHVQRNLIQI	2146
TRICHIANELLA	LKEDE-----AI-----P-K-DSLNDLL-KFCVKH-----CWSKS-KVFRKRLRI	2161
BEEBLE	VTLET-----Q-----TEI-QLASKLV-AFLINN-----LKNDR-KDIFKYHLQI	2079
BARNACLE	DITPE-----E-----SSR-ADAGRLL-EVVLRL-----TPSAH-RGVRIMLDV	2101
THRIP	HQTV-----V-----VLNK-SQLNLF-GYLVKH-----CPHSD-KAVLYRHELE	2113
FLA	AIPSS-----TS-----IQR-NIASQFM-YFLMKN-----AYHER-RAIYKLMMEI	2120
WHITEFLY	AVPDG-----KK-----DENR-TVSELL-SFLMAN-----TESFN-KRVFRNLEI	2176
TICK	WSLED-----RK-TV-----GND-RDQGFV-ELLAQR-----CGHER-REVLKNNLEL	2145
TERMITE	WCRKT-----TS-LPAKSDH-HLVSQL-LYLLISK-----VHHDR-RDVFKNLEL	2192
DAPHNIA	APPSA-----NDV-----EFA-QAASSLL-QFILRN-----IENKN-AEILRDIEM	2033
OSTREOCOCCUS	FDEAK-----E-----PCLLDAL-EIVLKC-----GHSKY-VGVMAKMLAL	2143
STENTOR	SLEAK-----E-----KBAKGLF-NLIVKV-----GGDLN-KEIFKSNIKI	1940
KLEBSORIDIUM	KFPNP-----K-----SKATDL-GHLMRV-----SAHPT-RVLYRIMLDV	2340
CLUBMOSS	EPTDR-----V-----HTASRP-DHLMV-----AAHES-ROVLRANVEI	2104
MOSS	SAPDG-----V-----RLATNFV-HHLISV-----ADHGS-ROVLRANIDI	2225
LIVERWORT	CPPDP-----V-----GMASEPI-THLMRV-----AAHPS-SPVLRANVDI	2252
LIGNANO	AIPED-----DL-----GDR-DLVERLL-DKLTGL-----CYDKE-RRIFKNNWRL	2342
COPEPOD	TGTV-----V-----TON-LVVSRLM-TLIMKN-----VYHEE-KRIFKANTEM	2125
GLOBOSUM	AHAVTK-----AD-----DSV-TI-LKTM-RWLIRH-----CNHES-KATIRNHLRI	2088
PALUSTRIS	TNGEETKQSLGLDDH-----DTR-TILFKMMESLVASV-----CVADS-MPEVRENELE	2152
NEOCALLIMASTIX	VKIEN-----NS-----ENR-FNFNMNM-NYILKY-----SNIQD-LLSIRVVIDI	2223
GLONUS	ITLE-----SY-----QDK-VLIYELM-EFLMKN-----SYNES-RIVIRNMLI	2283
LOBOSPOR	VKLED-----SY-----DDR-VLLLSFL-SYLMKN-----CYHEQ-ROYLLNMLD	2212
SYNCEPHALASTRUM	VKLED-----SY-----EDK-TLLFYFT-NYLMEN-----AYHET-ARLAKNMQE	2196
FUNCTIVORUM	LDPKD-----S-----FQANLL-NHLER-----CGYPD-KRIFKSNIKI	2177
HALBUM	YDQK-----LD-QLDTLSK-SNISKPI-NFLIQN-----SYCAD-ROILRNHLNI	2314
DURPUREUM	YKLE-----GEIRPPTSLE-NHLSKPM-NFLMKN-----TYPCD-RRLIKSNLNI	2317
PVIOLACEUM	YSVSD-----K-LPVAFSTK-QLISKPI-NYLFKN-----CYCSD-RRLIKSNLNI	2309
AMPHIPOD	GAPND-----PD-----D-S-PLLAKLM-CHLITS-----LPHLR-ADVFRYNDV	2216
SHRIMP	AVPQD-----TV-----MGR-NIVGRVL-RYLCMN-----TPQTR-ADIFKYNLDV	2209
MUDCRAB	AGSQD-----ST-----MGR-NMVSRLV-RFLCSN-----TPHNR-ADVFRYNIDA	2204
TARDIGRADE	TPLPG-----GQD-FRAQRFV-LFLIQH-----VKHSN-ROVORNLT	2281
HYDRA	SIPEN-----TA-----SGS-ILASSLL-DYLVKN-----SHNLD-SPVLTQNLNLYL	2145
SALPINGOBECA	AVPQD-----DS-----EK-RLARQLV-QFLMEN-----ARHET-TAVFKNNVNI	2233
SPIDER	AIPQD-----ND-----ML--KASEVL-KFVMNM-----IEHSR-RDIFRNNLEL	2219
LIMULUS	AIPED-----TV-----IGR-HAANSLL-EFLMTK-----CAHPR-KDIFRNNLEL	2224
SCORPION	AIPED-----SS-----IGR-HAANSLL-EFLMTK-----CFHPR-KDIFRNNLEL	2207
ROTIFFER	AVPQD-----S-----EA-KLINRFL-TLLKLR-----CYHER-RAVFRNNLEL	2216
CIONA	AVPQD-----SV-----EGK-SLVGRLL-EQLERR-----IHHNN-RAIRHNLDI	2234
OCTOPOUS	SIPGD-----TS-----KDR-YVASSLV-QFILRN-----LYNAN-RTIFRNNKL	2181
CAPITELLA	AIPEE-----TT-----VDI-AMTSHLV-KYIVON-----CYHON-ROIMRNNLEL	2232
LIMPET	SIPQD-----TA-----EER-AMSSRLV-QFLMAN-----IYHKN-KOIRNNLEL	2214
SCALLOP	AIPQD-----TA-----EER-AMATRVV-DYLMAN-----VFSET-RPVFRNNLEL	2266
LINGULA	AVPQD-----TA-----MDR-AMASRLV-EFVVRN-----VNHDY-ROIFRNNLEL	2234
OYSTER	AIPQD-----TV-----EDR-AMSSRLV-EFVMGY-----VYNDY-RPVFRNNLEL	2232
SNAIL	AVPQN-----SS-----TER-AMASRLV-EFLVVR-----VHHEE-RAIFRNNLEL	2235
SPONGE	AIIED-----RF-----LGSQLL-EYIMLR-----SNHKN-RSILRNNLEI	2260
PRIAPULA	ARPQD-----NM-----TER-SLASRLL-EFLMKN-----ARHAT-MSVFRNNLEI	2259
DANTO	ASPKG-----NT-----RDE-ILANRLL-GFLFKN-----CFHSK-RAVFRNNLEI	2245
ESHARK	ATPKG-----NM-----KDE-ILANRLL-EFLMKN-----AFHEK-RAVFRNNLEI	2246
BHARK	ATPKG-----DL-----KNE-ILANRLL-EFLMKN-----CFHEK-RVFRNNLEI	2244
XENOPUS	ATPNG-----QA-----KEE-ILANRLL-EFLMKN-----VFHEK-RAVFRNNLEI	2257
STERLET	ASPKG-----NT-----RDE-ILANRLL-EFLMKN-----AFYDK-RAVFRNNLEI	2260
GAR	ATPKG-----DT-----KDE-VLANRLL-EFLMKN-----AFHEK-RAVFRNNLEI	2249
HUMAN	ATPTG-----VP-----KDE-VLANRLL-NFLMKH-----VFHPK-RAVFRNNLEI	2237
PLATYPUS	ATPTG-----VT-----KDE-VLANRLL-EFLMKH-----VFHPK-RAVFRNNLEI	2241
TASDEVIL	ATPKG-----VP-----KDE-VLANRLL-QFLMKH-----VFHPK-RAVFRNNLEI	2243
COELACANTH	AAPKG-----NT-----RDE-ILANRLL-EFLMKN-----TYHEK-RAVFRNNLEI	2248
CAECILIAN	ATPAG-----LA-----KDE-ILANRLL-EFLVTH-----SFHEK-RAVFRNNLEI	2250
CANARY	ATPKG-----NI-----KDE-ILANRLL-EFLMKN-----AFHPK-RAVFRNNLEI	2239
OSTRICH	ATPKG-----NI-----KDE-ILANRLL-EFLMKN-----AFHPK-RAVFRNNLEI	2209
GECKO	ATPKE-----NI-----KDE-ILANRLL-EFLMKN-----AFHPK-RAVFRNNLEI	2248
TURTLE	ATPKG-----NI-----KDE-ILANRLL-EFLMKN-----VFHPK-RAVFRNNLEI	2248
ALLIGATOR	ASPKG-----NV-----KDE-ILANRLL-EFLMKN-----TFHPK-RAVFRNNLEI	2206
APLYSIA	AIPED-----SA-----EGR-AMASRVV-SFLIAN-----VFHTN-ROVFRNNLEL	2269
TRICHOPLAX	AIPKD-----VD-----EI-LQANRLM-EFLMKN-----AFYFN-RSVLRNNLEI	2227
SOFTCORAL	TIPED-----SY-----SSR-RLTSRLL-EYLMET-----CNHPT-RSIFKNNLEL	2246
STONYCORAL	AIPED-----SH-----NDR-HLASRLL-GFLMSR-----TRHRH-RSLFRNNLEI	2272
SEA ANEMONE	AIPED-----SY-----GDR-HLASRLL-QTVMRR-----THHEN-RAVFRNNLEI	2234
SEACUKE	AIPED-----KY-----LASQLL-RFLMLN-----VHHAK-RAILRNNLEL	2245
LANCELET	AIPED-----SA-----MGR-ALTSRLL-HFLMAN-----AFHKT-RAVFRNNLEL	2271
STARFISH	AIPED-----KR-----LANRL-EFLMHF-----CHHSN-ROVLRNNLEL	2284
SEA_URCHIN	AVPED-----NR-----LASGVL-RFLMKN-----SYHER-RSVMRNNLEL	2268

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	IIMFVQLRDSM-Y--ICDKIIVD-MISKKPDQKIQQ-----LDP-QAEDTSVLWQANGL	2153
TETRAHYMENA	LKNIILDLKKECI-Y--VDENLTKP-MLLLED-----K-EDKEKSQLWNLNSI	2270
STYLONCCHIA	IAGLHRKRLV-A--INKDVISM-MIGMDD-----KKPESNLWKMTGI	2254
APHANOMYCEsa	IIFAVTKPTQC-RF-LNLDLILL-MIN-A-----DDA---ENASRHVAGM	2067
APHANOMYCEse	IISFLFRPQSC-RF-LNGDAIMD-MIG-G-----DGNDD--KLDTRHVAGM	2012
PYTHIUM	VSELIALLKDDV-RI-DRDEVKLL-LFSSE-----DNNP--KREAADRYTAL	2202
PLASMOPARA	VSELIALLKDDV-YI-NVRELIIF-MMS-G-----DEDT--KIKYARKFVAL	2187
BREMIA	VKRLIALLKNI-LYI-DARELIH-IIS-E-----DGTI--KLNNAKQPAAL	2173
AEDDES	VKRLIEQKRAVI-SV--PVQLLYD-MIG-P-----TQDPESMQ-----NIGGL	2258
MIDGE	IKKLVETVKEIL-VVKIPSQLLD-LLOKP-----LEEEMNLN-----LRCGI	2208
BOMBUS	VKVVLEVHPYL-KL--PKNLD--KMSFA-----PGATVY-----	2116
ANT	IKMVEKRRYL-RV--PSDFLQ-KIISA-----DTTVMY-----	2144
WHIPWORM	VSPMGLIKDVI-AV--DFKILLD-HCVA-----D-TDGE-----NAFGV	2182
TRICHOINELLA	IEMVLVMSFV-TL--DPSLILE-KICFP-----LGNENE-----NVCGI	2198
BEEFLE	IRLLVEAKTSI-EV--PYDLIYA-KIKVE-----PTCKA-----VEIGI	2115
BARNACLE	LEKLVSGHIDRA-AF--PGRLAVQ-LITGD-----RQLHA-----PRAGV	2137
THRIP	IKMVEVKNYI-DP--PHDILLS-MLDNP-----D-----ARVGI	2145
FLA	IKSVVEIKTCL-DF--PLQYLIL-ALENP-----VKDSK-----TNMGI	2156
WHITEFLY	VKVVVEVKSLL-DI--PYQLLLD-LLKPE-----DNDPKSEK-----AQGTI	2215
TICK	IRAWVETVRELR-RF--PADVVLE-OLEQC-----SLDSK-----DHHAV	2181
TERMITE	IRVVVELKPNF-DI--PVQLLYD-MIMKH-----DRKDPT-V-----SEPGI	2230
DAPHNIA	VRAIFLVNKRISLN--IPYELVEE-LIS-----PDKSK-----RKLGL	2068
OSTREOCOCCUS	IIRMFARLKDVAISIGTPPACFQNAFHRANELL--ELVP-KSKSQEEKRFVTQKKLFVM	2200
STENTOR	IIEELAKNRPYL-E---HRLDLC-MKKQ-----LKDLD--NKISYIKWLFGI	1981
KLEBSORMIDIUM	IKFLAKNSDF-S--VDRKRLR-YLAD-----GSDA-----KVKFAGI	2378
CLUBMOSS	IKAFIQLKDRV-N--IDGRLILK-YLAG-----GKSTNTSDRQLIQKSVGL	2149
MOSS	IRLFLENKSTI-S--LERGQLQ-YLISG-----GRNPDMDNRIMKRLVGL	2270
LIVERWORT	IIRMFIDTKKVL-Q--FDKNIILE-KLAFG-----GKGASGTDRSVRMQRALGL	2297
LIGNANO	LDALIRSRSRVHC--VPYKRFD-LIQ-----QTEE-YTA-----AAAGL	2379
COPEPOD	IRLVIEKVKDCD-VVSANFSVID-LLE-----ANQGDLS--HFGAL	2163
GLOBOSUM	VRLLIENKDFM-I--VPSDVIFE-LIH-----AKPDGNNK-AEKYLNLTGV	2130
PALUSTRIS	IASFIEIPLSIL-V--APTRIIYE-YIT-----NOKREN-----LLAGI	2187
NEOCALLIMASTIX	IIEFLNKIKDFI-D--TPVELIYK-FLS-----NKNNSDQV-YSVSVINLAI	2265
GLOMUS	IKAIFELIKELI-V--VPTHVHE-LFS-----DSVGNVDR-----VYTGL	2320
LOBOSPOR	IKQFENRNMIA-I--VPTTIIYN-NFK-----NIKDDK-R-----NITGI	2248
SYNCEPHALASTRUM	VKNALENKDRR-I--PPTKIMYN-QFN-----PRDKNAGQ-----IRVGL	2233
FUNCTIVORUM	VKMEQKDFY-I--PSKVCILA-TLSYGLTVVQQRIVEMLDADANTHT--KITAL	2227
HALBUM	LKLFVERKGLF-S--VEKKIIVE-ALATPV-----TNFKSKAROV-----RSTAL	2356
DUPURPUREUM	VKSFERNRSLF-H--INKNIIE-LLL-QK-----GDFKSKSRQM-----KTTGL	2358
PVIOLACEUM	IKQFERNKGLF-T--IDQSIIVE-YLV-QK-----GDYKSKSRQI-----KTTGL	2350
AMPHIPOD	LRSLVSNWASPT--VDGSATIE-LLE-----TREGHKRE-----VDAGL	2254
SHRIMP	VRSVVECKSLL-T--VPYTIYS-LME-----VKDGAERE-----VEAGL	2246
MUDCRAB	VKSVECKRAVL-T--VPYALIS-LME-----VSDGRNKE-----QEAGL	2241
TARDIGRADE	LKVLIEAKAQL-E--IPPRGIPDLLI-----KDKTKAKL-----NIPVI	2319
HYDRA	INALSSRRDRV-T--CPYKLIYS-LFS-----FSDQNSKK-----NLRGL	2182
SALPINGOECA	IRILLERKDAV-QDKVPFKVIVD-NMS-----SRQMASKO-----NLSGL	2273
SPIDER	VKVLIECKRS-L-K--IPYNIYE-KMS-----DFSPESQK-----NHFGI	2255
LIMULUS	IKVVVECKPRL-E--VPTRIIIG-OMC-----MTDITRKE-----NLVGI	2261
SCORPION	IKVVVECKERL-D--IPYRIIFE-SHR-----NLDKPKVD-----NIVGI	2244
ROTIIFER	IKMVECKRDM-Q--VPVELIN-FLT-----SN--DHRK-----LSTGI	2251
CLIONA	IKVTECKQERV-RGGVDPNHIVQ-LCE-----SNDVDLKE-----NPAFL	2273
OCTOPOUS	ILALVGLKARI-D--IPYKLIYE-MMT-----SSDPNTGG-----LMVSV	2218
CAPITELLA	LKVLVEAKSTI-R--IPYKLIYE-NFI-----DREDKGRK-----NVVGL	2269
LIMPET	LKVLVECKHRI-E--IPYKLIYN-OLK-----SEEN-----KSVGI	2247
SCALLOP	LKVLVECKRDL-E--VPYNIYK-LMV-----ESRSDPKSPR-----HSTGI	2305
LINGULA	LKVLVECKGRF-D--MPTKIIYD-NFS-----DRDPKSKT-----NTAGV	2271
OYSTER	LKVLVECKRDRV-E--IPYNIYK-HLK-----QPDETKKE-----SCVGI	2269
SNAIL	LKVLVECKDCI-E--IPYKLIYN-OLK-----MPDPSSKS-----SLIGI	2272
SPONGE	VRVMVELKDKI-D--IPTRVIYD-QFS-----NSDKSTVS-----NLSGI	2297
PRIAPULA	IKVLVECKRDRV-D--VPSQVIYE-NMC-----AGDITMRD-----NSVGV	2296
DANTO	IRVVVECKRDL-T--IPYDLIYE-RFA-----GTDPNKSK-----NSVGI	2282
ESHARK	IKVVVECKDCL-S--VPYSLIFE-RFS-----STDPNKSK-----NSVGI	2283
BSHARK	IKVVVECKDCL-S--IPYSLIFE-RFA-----GRDPNTKD-----NSVGI	2281
XENOPUS	IKVVVECKECL-S--IPYRIIYE-GFS-----GTDPNTKD-----NSVGI	2294
STERLET	IKVVVECKDCL-A--VPYSLIFE-RFS-----GKDPNSKN-----NSVGI	2297
GAR	IKVVVECKDSL-M--VPYSLIFE-RFA-----GSDPNKSK-----NSVGI	2286
HUMAN	IKVVVECKDCL-S--IPYRLIFE-KFS-----GKDPNSKD-----NSVGI	2274
PLATYPUS	IKVVVECKDCL-S--IPYRLIFE-KFA-----TGDPNTKD-----NSVGI	2278
TASDEVIL	IKVVVECKDCL-S--IPYRIIFE-KFS-----NRDPNSKD-----NSVGI	2280
COELACANTH	IKVVVECKDCL-A--VPYSLIYQ-RFS-----GKDPNTKD-----NTVGI	2285
CAECILIAN	IKVVVECKDCL-S--IPYRLIFE-RFS-----NGNTNSKD-----NSVGI	2287
CANARY	IKVVVECKDCL-S--IPYSLIFE-RFS-----SGDPPTKD-----NSVGI	2276
OSTRICH	IKVVVECKRCL-S--IPYSLIFE-KFS-----GGDPNTKD-----NSVGI	2246
GECKO	IKVVVECKDCL-S--IPYRLIFE-RFS-----GDPNTKD-----NSVGI	2285
TURTLE	IKVVVECKDCL-S--IPYRLIFE-QFS-----GGDPNTKD-----NSVGI	2285
ALLIGATOR	IKVVVECKDCL-T--VPYRLIFE-QFS-----GGDPNTKD-----NSVGI	2243
APLYSIA	LRLLLECKHVRV-D--IPYKLIYQ-LFK-----STDPSKGR-----SSTGV	2306
TRICHOPLAX	IKHAVELKNHI-E--IPYRIIYK-NFS-----NPDKKDKD-----NSTGI	2264
SOFTCORAL	IKHFEVVKERI-D--VPYKLIYE-RFS-----NASVNTKE-----NSVGI	2283
STONYCORAL	VKSVEVKSIL-H--VPAEVIFN-SFS-----DPDPVKKD-----NAVGI	2309
SEA ANEMONE	VKMVEVVRERV-T--VPTKVIYE-ALS-----NPHPKDKD-----NATGI	2271
SEACUCU	VKVLVEKPVV-D--IPTKVIYN-YLS-----NKDPASNT-----NTVGV	2282
LANCELET	IKHAVECKTRV-E--VPTKVIHD-OLC-----GSDASSKA-----NSVGI	2308
STARFISH	IKVLVECKEII-S--VPTKVIYN-ILA-----TPDPVKD-----SSTGL	2321
SEA_URCHIN	IKVLVECKDVI-D--VPTRVIYE-SIQ-----DRSPDKKD-----SAVGI	2305

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYL, EXPANDED

PARAMECIUM	A-ILHIALNNVVILQDYPEFVRTANSSLYEKYRFLQKQ-----SHNIKFPTEITNR	2205
TETRAHYMENA	L-ILACIQLRIPILSNYEFASRAQTV--EKKFAPFLNIS-----E----KDR-LKR	2314
STYLONCHIA	Q-ILHLAVSFIDLVIEKPNIGQTNNVN--QREFRFOEQNE-----NQ--LGDKIMNS	2301
APHANOMYCESa	Q-LAAVNLINLAFDASSPVWFET-----SLR-----ACSSRELTALLAR	2105
APHANOMYCESa	Q-IVMMLLSLAFDATSPATSFEF-----LLR-----NARAKLENNLLTR	2050
PYTHIUM	Q-IVSHMLTAGLVEDILP--DF-----DM-----SDGKTIEDGVLES	2236
PLASMOPARA	Q-IVSAMLVAGLKSLELQA--EV-----ANQTIEDGILLC	2218
BREMIA	Q-IVSAMLTAGHISKLRV--QV-----SDHTIEDGILLV	2204
AEDES	Q-LNMVVMANGLVFW--T-----E-TS-KFDFIRAFIRC	2287
MIDGE	Q-LNMVLLINDIVFW--K-----D-SEQKQFIAAVINC	2238
BOMBUS	--LILCFINGMLD-----I1QRNDLFFERS	2143
ANT	--LILVLDIMAEF-----I1VRNDVDFLLKP	2171
WHIPWORM	Q-LLGVLMKMKKPCCEL-----GDPEKDQRIFFEYLINR	2215
TRICHINELLA	S-ILGLCLNTVPEFTSFL-----TDPNYESGIFSHLVR	2231
BEEFLE	H-VSIFLANKLPLW--K-----G--DSKDFCKSIFVI	2144
BARNACLE	CALRQALLADRPLCL--D-----R--EEMQQLDRLLTL	2167
THRIP	N-LTMIMLPHKLTPTW--T-----T--KSKQSFISFLKN	2174
FLA	E-LACILLANKIIPW--P-----D--SKKDDYKALCMQ	2185
WHITEFLY	M-LACILVVNNIAPY--A-----S--ASKMKYKALVRK	2244
TICK	L-LFGIFVSNLVEF--G-----QSHASTARILEVLPR	2212
TERMITE	Q-VAITLANRLEPW--S-----S--TGKLQFLRALRN	2259
DAPHNIA	L-ILDAIVVHDFLPKNHE-----F---NSRFKQQLVKW	2097
OSTREOCOCCLUS	Q-LIRGLHEETKIQVDMVEFV-----ITNSRGEQIDG-GRSPLIQAVMSC	2246
STEINBOR	L-THEALDKRIKILSDG-----R-----EYRSEDSDSLLKS	2012
KLBSORMIDIUM	Q-LFVLLAVGCHKIYDYSI-----ED--AA-IPEPKYGRLEEC	2412
CLUBBOSS	Q-LFVHWSSSGSNVQGL-----ER--LA-VGREDEVETLLSN	2183
MOSS	Q-LLCAIVGSGIPIYDPS-----CD---FS-TSEEHICALLNN	2304
LIVERWORT	Q-LFSAIAASGLPLYPDA-----CD--MF-IE-KDLYQVLLQN	2330
LIGNANO	Q-LYNAYLSNALPYFNEQ-----QGVNVGG-VDSPQLAALVRL	2416
COPEPOD	K-VLVFLGQQM--FDR-----R--LETPGLCQKICQT	2192
GLOBOSUM	Y-VLVQALVANKVSAYDA-----RGLTDRI-FSESDLDSLSSL	2166
PALUSTRIS	Y-LTLVVVTHGVPPFDM-----RGLGALS-LSEDTCDAPMNL	2223
NEOCALLIMASTIX	Q-ILLSFVSNIDPEYNEL-----NMTTSDSYSETDYSVLANY	2303
GLOMUS	Q-LLGVLAHDKPLFQDE-----VGLDLAG-LTSDKFYMDLNN	2357
LOBOSPOR	Q-LLGVLTNDHPPFYRG-----PEIDLGT-LRESDYEALVRN	2285
SYMPHYALASTRUM	Q-LVGLLVHGIKPPFYRG-----EGFTLNG-LTEHQYAACGN	2270
FUNGIVORUM	Q-LLGVLANGLFPYHDE-----QD--TF-ISKVIMOLIMSN	2261
HALBUM	I-QLSLLLNSGYAAYDKE-----ND---SE-ISEPKYQIILLDC	2390
DURPUPUREUM	V-LLSLLLNGFPAYDKD-----YD--SDL-ISEPKYQIILLDH	2393
PVIOLACEUM	V-LLSLLMLCNGIPAFDAS-----NHG-TGG-QSEPKYQIILLDN	2386
AMPHIPOD	H-AAA CLLVAGVSPYNEQ-----DR-MQERKMHGVLKLC	2286
SHRIMP	Q-LLGVLANGLPPYTV-----SE-TEKKRCSLVIRL	2278
MUDCRAB	N-LLGVLANGLPYTED-----SV-AEKTCEKILLLKL	2273
TARDIGRADE	N-ILMILLNAGLPLTAGS-----FEEELKILMLH	2347
HYDRA	Q-LLGVLANGLPAPATQ-----I--SG-LTEYDYLALSN	2215
SALPINGOECA	H-LLSLLANDMMPSEDS-----VE--EAG-LSMRSFQILVAN	2308
SPIDER	Q-LLGVVLSCDFPPYDQ-----D-E-AEGYSFLTLLRN	2287
LIMULUS	Q-LSFVLANGLSPYSDT-----GK-LEKARFLMLASN	2294
SCORPION	Q-LFELVNSGLDPYQNT-----S-R-IDKISLKTIEN	2276
ROTIFFER	Q-LFVLSWGLNEMFYP-----MD-ISRLDFKSLINC	2283
CLONA	Q-LLSAPLVNKSFPFAGE-----Y--TLD-VDRQYQRIFRN	2307
OCTOPUS	Q-LLGVLLKCNFSPVNM-----TD-VPRETFSHLSQG	2250
CAPITELLA	Q-IVGVFLANGLSPWQP-----AE-VSKDRYQYLAMN	2301
LIMPET	Q-LLGVVITCKFPYPYGP-----CP-VDRHFTTVVFL	2279
SCALLOP	Q-LLGVVLACKFPYPYGP-----AP-VDRDKFSTVSNY	2337
LINGULA	Q-MVGVFLANKLPAYSYT-----SE-VDREKTYKALASN	2303
OYSTER	Q-LMGVVLSAKFPYAPT-----AP-VDQEKFTTVAQY	2301
SNAIL	Q-VLGVIMTCNYAPYGPS-----AG-VDRNRFTTLASS	2304
SPONGE	Q-LVGVAVANELNPYDTN-----T--AGS-LDQGLYKIFVNN	2331
PRIAPULA	Q-LLGVVVAANLPPYSHT-----TA-VDSEKTFQALVRC	2328
DANTO	Q-LLGVVVAANLPPYDAA-----CG-IEHDRFQSLANN	2314
ESHARK	Q-LLGVLANLSPYVFK-----CE-IGYERFORLVYN	2315
BHARK	Q-LLGVLANLSPYDCK-----CE-IDSERFORLVHN	2313
XENOPUS	Q-LLGVLANLSPYDCK-----CG-IDPERFQSLANN	2326
STERLET	Q-LLGVLANLSPYDCK-----CG-IDSESFQALATN	2329
GAR	Q-LLGVLANLSPYDPS-----CG-IEHERYFKSLANN	2318
HUMAN	Q-LLGVMANDLPPYDPQ-----CG-IQSSYFQALVNN	2306
PLATYPUS	Q-LLGVLANLSPYDCK-----CG-IDSARYFQALANN	2310
TASDEVIL	Q-LLGVIMANLPPYDSK-----SG-IESTRYFQALVNN	2312
COELACANTH	Q-LLGVLANLSPHDP-----CS-IMESTYKALANN	2317
CAECILIAN	Q-LLGVLANLSPYDCK-----CG-IDVERFQALANN	2319
CANARY	Q-LLGVLANLSPYDCK-----CE-IDVRVFQALASN	2308
OSTRICH	Q-LLGVLANLSPYDCK-----CE-IDVRVFQALASN	2278
GECKO	Q-LLGVLANLSPYDCK-----CE-IDVRVFQALANN	2317
TURTLE	Q-LLGVLANLSPYDCK-----CE-IDSVRFQDLANN	2317
ALLIGATOR	Q-LLGVLANLSPYDCK-----CE-IDSTRYFQALVNN	2275
APLYSIA	Q-VLGVVLSADFPYVPS-----AP-VDKDKLSSSLNL	2338
TRICHOPLAX	Q-CLGVVANGLSPYRYD-----VE-VDE--MLALAN	2293
SOFTCORAL	Q-LMGVIVANKITPFPKG-----CG-VDEKRYQDLVKN	2315
TONYCORAL	Q-LLGVVANGLFPVYSD-----ST-IDEDRYGTLVNN	2341
SEA_ANEMONIE	Q-LLGVVLANKIHPPSSD-----SS-VDENTYATALSDN	2303
SEAUCUKE	Q-LLGVVLANKIHPPSST-----SD-VDSEYFQALATN	2314
LANCELET	Q-LLGVLANQLPPNPS-----T--SGN-IDREQFSAVAKN	2342
STARFISH	Q-LLGVLANGLHPIDKA-----SD-IDEERYAALSNN	2353
SEA_URCHIN	H-LLSLLANLHPLSPT-----CD-VDADRYSALASN	2337

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	---LAC---TYTTKKKHLKGFENNVYKVLQCCQ-----YL-----KVSQNDYEQ	2243
TETRAHYMENA	---LLLPQOHSKRQYCKMASAVCCGLSLMMHEYG---GQF-----EGKRRKIYEQ	2357
STYLOENCHIA	---LLKLLSKKKKQLIQMASFTLGRILNKOPS-----	2330
APHANOMYCEsa	LASTT---HKTTP---OLAADVSLVLOHMPAS-----T	2133
APHANOMYCESe	MVS-M---HKTTP---ILAADLADGLVLKMHMS-----T	2076
PYTHIUM	---LY---HKRASLVTAAEISGLLLKAKTGSK-----AQ	2265
PLASMOPARA	---MT---TKVTSLVTAAGVGGLYLLTMDQAT-----SK	2247
BREMIA	---MT---SKTTPLVTAAGVGGLYLLQTRTQID-----TD	2233
AEDES	---L---DSEKAAVIRPASELTMCLNNLYPGGE-EQE-----D---E-RY	2322
MIDGE	---F---RHNSQITRADAALMCLHQIVGDCCQ-MVE-----G---DENF	2274
BOMBUS	---LKKWOD---EETHLQCCYGLLLKSLNDMT---LA-----NKRK	2179
ANT	---LSVWDTSKADELPLQCCSLTLLRSLDNTTH---HE-----TERENKKY	2213
WHIPWORM	---L---SSKHAHVKGAVYCHLLSALSVM-----GG	2243
TRICHINELLA	---L---SLKNVLLKLAAPVCHLLKVLNELQ-----TDCE	2262
BEEBLE	---L---KAKYKTVRBCAELLGLILRETSH-----DLP	2172
BARNACLE	---M---VDRSSTAELRPASTVWALL---CA-GR-----TDIE	2196
THRIP	---L---NNNTKEVYKASAEITGMCLNQMCLNDGLLS-----I---EDQ	2210
FLEA	---F---NSMESITVRKCSAEVIGMVLNLSL-G-----SAEN	2215
WHITEFLY	---M---HSQKTTVEETPAVIGRILLFLQOEGSDYQL-----T---NDGS	2281
TICK	---L---ASRYGAVTSVADVGLLIRKMSAEGT---A-----EDS	2245
TERMITE	---I---DTEKRSITQSSAFVAGMALLELAANGSGMLE-----G---DDA	2295
DAPHNIA	---LT---LDEKRDITRSCALCGSILIRETDHE-----	2125
OSTREOCOCCLUS	---LMSSTESTGGLLNSPASALLKIMEIDGNHP-----R	2278
STENTOR	---LE---VPRRQLIIEASLEIKRELYSBNQ-----T	2040
KLEBSORMIDIUM	---LG---FKAKEVIRPAAELIIRALFERPKT-----PDRDQS	2444
CLUBMOSS	---LK---LKAKEVIRASAVLQVLRDKSED-----TDL	2213
MOSS	---LN---VTKKEVIRAAALVGLIIMVYRKES-----RQVNEE	2336
LIVERWORT	---LN---FKGKEVIRASGELIGIVLQKHOAA---QDF-----RRPLDEQ	2367
LIGNANO	---LN---HSRKEVIRPACAVTGLCLRQMVTAQ---SVV-----P	2447
COPEPOD	---FT---SKRKEVIRAGAVTGLYLLTLRSNQ---N-----	2220
GLOBOSUM	---LT---LSKLLKEVIRPGLACIIGVLLFMETLHNY-----H	2198
PALUSTRIS	---LV---NGRKEVIRPASEVIGRWTSSARQHAGAI-----A	2254
NEOCALLIMASTIX	---IQ---YN-HKNVIRPASELCLLILKRLKKTGMNE-----	2333
GLOMUS	---LL---NHVNSVIRAAAEVGLLAVKHLRKYHCSE-----	2388
LOBOSPOR	---MG---SS-QKAVISAAAEVGLLVAYMKRHNSLD-----N	2316
SYNCEPHALASTRUM	---MD---NS-SREVAIPAPLALAKFLMIEKRRN-----I	2301
FUNCTIVORUM	---LFSBEGRAKELITRSEVAMQLAQMDKAGNSGSLSSGVSQTQASRQSTED	2318
HALBUM	---L---TEYKELVDAASHCIMILQFNHKK-----NIQS-	2419
DPURPUREUM	---L---QDFKELVDAASVCMILLYNSKN-----NIQS-	2422
PVIOLACEUM	---L---QDFKELVDAASVCMILLYNSKH-----QIQSN	2416
AMPHIPOD	---LA---NPRAAVINAAAEVGLMLARSMSR---GGVGDVAVPSSSSDLSLSEATVGC	2337
SHRIMP	---LG---AHYASVIRAAAEVGLILKYSQKD---G-----SVE	2309
MUDCRAB	---LE---AHYASVIRAAAEVGLLVKFOSSH---EDC-----NET	2306
TARDIGRADE	---LQ---ESSKPLVSVSGITLILFRAEGAGIAGET-----IE-	2381
HYDRA	---LL---PTYKEVIRPACAVCGIILKYYFSKC---ESP-----K-	2246
SALPINGOEA	---IM---FKRSVIRPAAFTVCMILSHFKSKGRGRLL-----D-	2341
SPIDER	---LS---MKYKEVIRAAAEVGLIILQYISKSE---TDI-----LKN	2320
LIMULUS	---LT---FVRYKEVIRAAAEVGLILNYMTERE---NQT-----EG-	2347
SCORPION	---LK---NKYKEVIRAAAEVGLILNYMTERE---NQT-----Y-S	2308
ROTIFFER	---IK---EPKLLIRPAAEVGLMLKRFDSHD---KEY-----FE-	2315
CIONA	---MR---FKRKEVIRAAAEVGLILNYITNVE---KEE-----NG-	2339
OCTOPIUS	---LH---HSHKIVRPAAEVGLILKYPDQHK---DSE-----FE-	2282
CAPITELLA	---MN---OPDKQVIRPAAEVGLMALSSLQNTESDKEW-----CR-	2335
LIMPET	---MC---DKSKPVIRPAAEVGLMLKYLEVKE---QET-----EG-	2311
SCALLOP	---LT---HHLRSVIRPAAEVGLMIFOLYAEKE---KET-----DG-	2369
LINGULA	---MG---SYWKTSSAAAEVGLMCLDLDH---KDF-----KE-	2335
OYSTER	---MR---NRYKAVIRPAAEVGLMIFKHLAEK---RQT-----EG-	2333
SNAIL	---MT---NSSKMITPAAAEVGLMIFAYLADKE---NET-----DG-	2336
SPONGE	---IT---FRYKLVIRAAAEVGLMIMKRMAESY---DPF-----LD-	2363
PRIAPULA	---LA---NKYKEVIRAAAEVGLMILHRMVERE---DEE-----AEG	2361
DANTIO	---LS---FVRYKEVIRAAAEVGLILNYMTERE---NQT-----EG-	2347
ESHARK	---IS---LTRYKEVIRAAAEVGLILVHYFAEN---KQV-----DG-	2348
BSHARK	---IS---LTRYKEVIRAAAEVGLILVQYLAG---KPM-----DC-	2344
XENOPUS	---LG---LTRYKEVIRAAAEVGLILVRYVONE---KRT-----EA-	2359
STERLET	---IS---FGRFKDVRPAAEVGLILMOYLAKNE---KQL-----EG-	2362
GAR	---IS---FVRYKDIVPAAEVGLILMOYMAEKE---KOS-----EG-	2351
HUMAN	---MS---FVRYKEVIRAAAEVGLILRYMERE---NIL-----EE-	2339
PLATYPUS	---LS---LVRYKEVIRAAAEVGLILQYVSEKE---TML-----ED-	2343
TASDEVIL	---MS---FVRYKEVIRAAAEVGLILQYIAKE---NVL-----ED-	2345
COELACANTH	---LS---LTRYKEVIRAAAEVGLILVQYAEKE---KEL-----GG-	2350
CAECILIAN	---IA---LTRYKDIVPAAEVGLILVHYVAEKE---KTL-----EG-	2352
CANARY	---MG---LLRYKEVIRAAAEVGLILQYIAERE---NIL-----ED-	2341
OSTRICH	---MG---LLRYKEVIRAAAEVGLILQYIAERE---NIL-----ED-	2311
GECKO	---MA---LVRKKEVIRAAAEVGLILQYIAEKE---NIV-----EG-	2350
TURTLE	---MS---LTRYKEVIRAAAEVGLILQYMAEKE---NIF-----EG-	2350
ALLIGATOR	---MA---LLRYKEVIRAAAEVGLILTRYIAEKE---NIT-----EG-	2308
APLYSIA	---MN---HHLKIVRPAAEVGLILVLLKMSRD---GEV-----EG-	2370
TRICHOPLAX	---LQ---FKYKEVIRPAAEVGLIMKHLASVK---KET-----EG-	2325
SOFTCORAL	---LS---FKYKDVIRPAAEVGLIMKYLSEEN---DKE-----SCD	2348
STONYCORAL	---LT---FKYKDVIRPAAEVGLIMQLAKVK---KIF-----DG-	2373
SEA ANEMONE	---LT---FKYKDVIRPAAEVGLIMKYLIEER---KVT-----EC-	2335
SEACUKE	---LK---SRFKVIRPAAEVGLIMFQMDND---QIT-----DG-	2346
LANCELET	---LQ---LTRYKDIVPAAEVGLIMKYMADVE---KVT-----EG-	2375
STARFISH	---LK---NRYKAVIRPAAEVGLIMKQKADV---KVT-----DG-	2385
SEA_URCHIN	---ID---NRYKAVIRPAAEVGLIMKQMAEND---KIT-----DG-	2369

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	EIINIVT---GIKAD-----NRPGYGKEK FTFMKIL ---TFV PKVLSNN ----	2283
TETRAHYMENA	EIVNNSV---N-IIN-----KTDKTSKER PIIVACI ---TQV YDPFLNNI ----	2396
STYLNONCHIA	-LVAQSI---HPLMN-----NEITERHDV VHSIEKI ---TRE YPELLIDR ----	2369
APHANOMYCEsa	AFESGID---NCLQSFQ-----LDKPR PLTCLKQL ---ATH YPAIVS ----	2171
APHANOMYCEse	TFQTSVE---TQLALFFQ-----EKKPR PLTGVKQV ---SFH YPPIVD ----	2114
PYTHIUM	AFRDKLA---EHTKYYS-----EEFGR LALLRSV ---SLH YPNVLD ----	2303
PLASMOPARA	CFLCNLK---KLADSVT-----SEEIG YLAAILRNV ---SIH YATIVD ----	2285
BREMIA	AFMCKLK---SLIKAYD-----EEDGR LAILRYA ---SLD YANIID ----	2271
AEDES	---QNEFV---AKLVTRM-----KRQEK KMDIITYGI ---HKA YPIIVD ----	2357
MIDGE	QIVSDIT---ERLEKIRR-----KAGNDF NATQLLYGI ---QKS YPRILD ----	2314
BOMBUS	AIIDTIR---SILRQ-----MQTKCEN RMKITRAL ---CKN YPLIAM ----	2216
ANT	EVKQKIF---TILGF-----VKPHT IKIKAVL ---CRT YPPVAL ----	2250
WHIPWORM	AFKEALR---SAMVKMT-----GTTLD RSKLLISEI ---HKS YSPAS ----	2282
TRICHIANELLA	WLLKNMK---AVMSRMT-----GTMLGR SKCLFLHEI ---LPN YEPAL ----	2301
BEEBLE	KLCGNVH---LLLKK-----INEPD KLAHLEGL ---VLH YPPIVN ----	2207
BARNACLE	AVTPVVA---AKLAA-----VEKDR VRVWTLARI ---SAH CRPLAA ----	2233
THRIP	KFVDELE---NILKNVN-----LAKRD CEKFLVLLDNV ---SEN YQIID ----	2249
FLEA	ILLSSVN---RRLDY-----LRRNNT DITILLYGI ---AKH YVDIAY ----	2252
WHITEFLY	TLNLSVK---TLMQR-----IYKPE PKYRCLLKI ---SL S Y PPVVK ----	2318
TICK	AFKGSVA---SRLDG-----LLAHRD QVVLVVRNV ---CR F Y PLAL ----	2282
TERMITE	EFLSGIV---DKLNL-----TKDQ SKDPLTCLFAV ---Q Y Y PRIVD ----	2332
DAPHNIA	-FEKLVV---DALQMWYN-----RKKVD VVDLLYEV ---AIR YPAVLS ----	2162
OSTREOCOCCUS	RWHDYLR---KRQSLYD-----AQAWD PLDPLDRV ---TKR CNPPPHDT ----	2318
STEWART	SLFALLS-----RKESKE IGVYVNIIRKV ---SIC H Y QLLNNK ----	2075
KLEBSORMIDIUM	LLERELH---QRLLSLYR-----FNSAT KAVTIAKAL ---CR T Y PPVAL ----	2484
CLUBMOSS	AVENKFK---QFVSTFK-----ERNY---SK LVILDRL ---TSK YPPYVG ----	2251
MOSS	ILEAKLH---KILKQLYR-----EA EY ---ER LNILNKI ---TIR YHPGLE ----	2374
LIVERWORT	MLEAPLK---QCLLKFCR-----ESNL---DY LNILYKI ---TFR YPOYGE ----	2405
LIGNANO	AFYQVA---EQLGKML-----TARPD ALHALAQV ---SRC CPRLAC ----	2484
COPEPOD	VFDKVLN IFL KALS MSL -----NSSAD TRSRITILHGI ---Q S Y PQILI ----	2264
GLOBOSUM	-----ASFLSK IEDVCK -----KLQ ASEPKSITILNRI ---SV H Y PRILQ ----	2226
PALUSTRIS	-----AQLEEK LNNLLRSLANGV ---RGS GAQDRVILNRI ---SV G Y PDVAV ----	2297
NEOCALLIMASTIX	AILNIIT---NKLELL---NPV---NTKN RTVDRKITILHQI ---GIN YBEILD ----	2375
GLOMUS	ALSSLLAN P LQKIS GMY ---Q Q AL S NE S DM KNITVHHI ---SM H Y VDVAV ----	2434
LOBOSPOR	DFQDLVT---KKSSELL V TSG P AP H TR S G S VS ITNLHKV ---QL H Y PEITD ----	2363
SYNCEPHALASTRUM	DMESMIV---EKLKRM---DPL---K Q E K ANT G KL S IT YRV ---QT H Y PEIAN ----	2343
FUNGIIVORUM	VCGQMPR---DKLMTFS-----KGDYD RINMERT ---DL A Y PPILIT ----	2356
HALBUM	VFEKLLK---DKISSFLS-----QSD YORALNLYFI ---GL H Y HRSFIL ----	2457
DPURPUREUM	VFSQLLK---DKINSILG-----N N ET ORAF S LYFI ---GL H Y PLPLQ ----	2460
PVIOLACEUM	TFQMLK---DKINTLLA-----N N D YORV S LYFI ---AL H Y PGFVA ----	2454
AMPHIPOD	EFFGDVV---ACVMDLI-----SK H Q AO CL SNLYHI ---HK H Y NTIDN ----	2374
SHRIMP	ALEDAVV---KRVTELT-----V K M Q GC L TI YNI ---HK H Y PSFVK ----	2346
MUDCRAB	SFEENVA---RKVMEMM-----H S K Q GC IT V IYKI ---HL H Y PAVLK ----	2343
TARDIGRADE	AGVEALR---QFLSGIV-----A T DR D K VAVLHQ A---SK S Y PAIVA ----	2418
HYDRA	VLLEMVQ---GSLCELS-----K N N K E K IT V L HST ---Q I N Y PM VVD ----	2283
SALPINGOBECA	ELMNEVV---ARLDQLKK-----D D D A T S K ER IT CL HE L C N V NTG H PPVVD ----	2385
SPIDER	KFFLVKS---QVLDTMK-----H K E S K L Y CLN K I ---H S S C PE IA ----	2356
LIMULUS	AFQNSIE---QRVTELS-----N T K Q D PT V VNKV ---HL H Y PPPIA ----	2362
SCORPION	EFCKLVK---TEISS-----L A K D Q L TL LYKI ---N H Y PIFTD ----	2343
ROTIFFER	---NTV---SHLFEIL-----RE A D TS L IT HE KI ---QL N Y AAISE ----	2349
CIONA	NVHEMVR---NNLSALP-----K N P K T Q D I TL LHKV ---SM H Y PPMVD ----	2378
OCTOPUS	KFMKQIE---RVMKTL-----E P KL G N IV CL HKM ---QL H Y PPVAE ----	2318
CAPITELLA	AYGDNIQ---KMLLGIIH-----G N K P D Q IT CVHCT ---Q K H Y AF VE ----	2372
LIMPET	EFHTYII---NNISLQ-----L S K P D N Y IC HK I ---H Q Y PPPTAD ----	2348
SCALLOP	AFYNHVT---GLMNSIH-----L S K P D N Y IG V HRL ---Q R H Y PP VAA ----	2406
LINGULA	EYVNHHL---SVLSLQ-----Q S N P D T ML CVYKM ---HL H Y HKPIAE ----	2372
OYSTER	TFHDYVV---NLMNSLQ-----Q S N P G N FL CIHRM ---HL H Y PPIAD ----	2370
SNAIL	QFHSHVE---SVL---G-----K V AP H PN LV CV HCT ---HR H Y PPMAD ----	2370
SPONGE	RLEEMVG---EQLFKLSQ-----P L E K S E D K IT CL HK I ---TL C Y KI V P ----	2403
PRIAPULA	ALRDVV---TAMSTLH-----A D A K Q N IT V CL QKM ---TL H Y PAIADREVMTAV ----	2405
DANTO	TLFNITV---TKLMDL-----R K KE V D D K IT V LSKV ---SK H Y PPIVD ----	2385
ESHARK	IVHDLLA---KELKQL-----Q---Q S K E D K IT V CL SKI ---V K N Y PP ADR ----	2386
BSHARK	AVHDLVV---KELQQL-----Q---N T K E D K IT V CL SKI ---V K H Y PP AD ----	2381
XENOPUS	PVPDYVV---KELKRH-----Q---Q T N K E D K IT ML LNKV ---V K N Y PP AD ----	2397
STERLET	PIFDFTV---KELKHL-----Q---N T K E D K IT V CL SKV ---V K N Y PP IVD ----	2399
GAR	PIFDFTA---HHLKKL-----Q---N E K E D K IT V CL SKV ---V K H Y PP FMD ----	2388
HUMAN	SLCELVA---KQLKQH-----Q---N T M E D K IT V CL NKV ---T K S Y PP LAD ----	2376
PLATYPUS	SICELIV---KQLKQH-----Q---N S R E D K IT V CL NKA ---V K N Y PP LAD ----	2380
TASDEVIL	SVFELV---KQLKQH-----Q---N T K E D K IT V CL NKA ---V K T Y PP LAD ----	2382
COELACANTH	PIIDSVV---RELKQL-----Q---S I K E D K IT V CL SKT ---V K N Y PP LAD ----	2387
CAECILIAN	PLFDCVI---KELKQH-----Q---N A K E D K IT ML LN KV ---V K N Y PP LAD ----	2389
CANARY	PVYDCVI---KQLKHH-----Q---N T Q H D K IT Q CL NKV ---V K N Y PP LAD ----	2378
OSTRICH	PAYDCVI---KQLKHH-----Q---N T Q Q D K IT Q CL SKV ---V K S Y PP LAD ----	2348
GECKO	PVFDLII---KQLKQH-----Q---N T R E D K IT IL LN KL ---A K N Y PP LAD ----	2387
TURTLE	PVYDCVI---KELKQH-----Q---S T K E D K IT V CL NKV ---A K N Y PP LAD ----	2387
ALLIGATOR	PIYDCVV---KQLKQH-----Q---N T K E D K IT IL LN KV ---V K T Y PP VAD ----	2345
APLYSIA	SFHDHLV---SLSNL-----S H A K T D N IV CL HRI ---H K T Y PK P T V ----	2407
TRICHOPLAX	PIFDYVT---QHLSSMVS-----A G R M D V A R IL CLYRV ---Q L H Y PI IAD ----	2365
SOFTCORAL	GLSGLLN---EKLSSM-----T K D L D K IT IL CV HQL ---Q I H Y PP IVD ----	2384
STONYCORAL	PLHDMVG---QKLLSLVN-----R A K P EL D K IT CV HKL ---K L N Y PP IVD ----	2413
SEA ANEMONE	SLIALVE---AKLSPMAT-----K G K D I G K IT CV HRL ---Q L N Y PR IVD ----	2375
SEACUCU	YLHQITT---KELTAL-----S N M---S P E I T INC INK I ---TL H Y PEFAN ----	2383
LANCELET	SFHTQVE---RYLLPL-----Q V N---Q D V PL CV HKT ---HL H Y PPFAD ----	2412
STARFISH	FLHSIVT---SELTKI-----S E I---K P D V IT IL HK I ---H F H Y PE FAD ----	2422
SEA_URCHIN	RLHEVTY---KELSQLHL-----G S G---K E V IT IL HKI ---HL H Y PVFTD ----	2408

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----KI-FQETANLIVQAS-NKERAE-ILRIFP-EPLFQI----EQSTQDPEF	2324
TETRAHYMENA	-----KI-LTYQDVIHQKS-KMDRAY-ILGSL-IFLKKK----LDKRENKKE	2437
SPYLONCHIA	-----KI-FMKLLSFVKTIT-GSMRAS-ILKXFE-RFINVC----RQRKKIE	2408
APHANOMYCESa	-----GVLNRLASLPRLLIQDTLSLHLLDVAH-CHVD-----ATTTL	2209
APHANOMYCESa	-----EVLNRLMSIFPRVWQDTLLCTLDIVYS-SNFQ-----AAEI	2152
PYTHIUM	-----SMLHRLSFVLPKVIALSAWSQSAVHCLFLALNNE-----EUVNEI	2344
PLASMOPARA	-----SMLQRLSSVLSKAVSDAWALLAADTVYNACGND-----GVVKDI	2326
BREMIA	-----SVMQRFVSVLPRAILLDAWALFAIDINHACRND-----AVVKDI	2312
AEDDES	-----S-LAVITNAVPMN-GAPKRI-LEEMLL-SRIEVEF-K-----EQV	2393
MIDGE	-----P-MTLIKFSIPKAI-GRIKTI-YLEMFL-ARLEIE-G-----EFV	2350
BOMBUS	-----DI-FDFVRRSVFRVD-FQGRKS-GLIEFL-LCIPNFTF-----DQI	2253
ANT	-----DI-ITWVIS-----AN-DLAASY-CLIEFM-LAISRFST-----EEL	2283
WHIPWORM	-----S-LABELLSWLPETH-GRLLKAL-CLIEFV-SPVDQR-----ESL	2317
TRICHINELLA	-----Q-CNDLLDWFPSLH-GDLKTA-CLIEFF-AVSKYK-----GDF	2336
BEEBLE	-----EVLNLSLRSRHGVP-KPLKII-YLRILL-SCRDDL-H-----K	2242
BARNACLE	-----S-RVRLLFQLPSEL-GEQKAL-GLQVLH-DIIGDV-----PQL	2268
THRIP	-----N-VSNILVYLNQI-AGHRAL-CLNLLS-KRLEVI-G-----GNP	2284
FLEA	-----P-ITYVIFNISRAI-DLQKTM-LLOILL-SVLELK-G-----EEF	2288
WHITTEFLY	-----E-LRQMVNFTGKNNNLQEK-CLDILQ-LSIDST-G-----SDL	2355
TICK	-----R-LDKLMLLLPRAL-ADFKVA-VLEVLS-LCCHQM-----EQP	2317
TERMITE	-----A-MNHVLFHLPKTY-GIFRTM-CLKIVY-SRLEIL-G-----DDT	2368
DAPHNIA	-----T-ASSNLSLITGLY-GGLKSR-CLIEVA-RSWYIM-----EDP	2197
OSTREOCOCCLUS	-----GL-APLVHSVIDKVI-GEKCL-ALMIVT-RSEDEE-VVRSTYERLLP	2361
STENTOR	-----NI-CFKLSGFIKPLS-GETRAS-LLLLLL-HYABYI-KTCSTFANLPL	2119
KLEBSORIDIUM	-----KH-ASKVAGVMSLP-GDFKIL-VLEML-GYAML-----LEL	2519
CLUBMOSS	-----A-LHVLDLPLRLH-GPSKTV-ALDILL-RDPATA-----NSY	2286
MOSS	-----G-AEMVVDQLSRLP-GAYKVN-ALDILL-RFPKAD-----ANL	2409
LIVERWORT	-----A-ASLLVDLLPKLP-GVLKVI-TLDFIL-RFPSCL-----RSL	2440
LIGNANO	-----IEF-RQRLLFQLPHLT-GDSLAD-CLVCLA-AAATAA-AVDSNCRWPNA	2529
COPEPOD	-----SL-ASKFQYSLKTL-GEDLSL-CLIEMV-SHASEL-S-----QHPQVL	2303
GLOBOSUM	-----N-YKVLFNLYPKLD-LDLKGG-SLEAIL-SWADAI-----PDL	2271
PALUSTRIS	-----D-YAKDLLFILPRLY-GRVRAK-CLYALS-SSAPDI-----EGL	2332
NEOCALLIMASTIX	-----K-YLVLLFLFPLNLS-IDRKIQ-ALBITRLRCQTRK-----DTL	2411
GLOMUS	-----R-LKYVFGILPRLN-N-NKIL-ALEITS-FCAGHD-----PDL	2468
LOBOSPOR	-----A-GPRLLFLFPOLL-GEERRL-ALEIFS-GRAAHR-----PDL	2398
SYNCEPHALASTRUM	-----K-ANKVIYLLPSLV-GDLKVL-ALMIVG-RAVTEL-----DDV	2378
FUNGIIVORUM	-----HH-YPRIFQILPRVH-GDFKTV-ALDILL-DWVEHI-----TDV	2391
HALBUM	-----Q-QLKLLNLLPOLS-NEIRLV-ARVVIY-WIADDI-----PEL	2492
DUPURPUREUM	-----N-YGKIFNLLPQIS-NETRLI-VLHIVL-WCVDDI-----QDL	2495
PVIOLACEUM	-----S-YSKI FNLLPQLT-NDIRSM-ALNLLS-WCSNDI-----PDL	2489
AMPHIPOD	-----R-TSKLLVLLPKLY-GLQKMR-AMECLI-APLSTH-----PDC	2409
SHRIMP	-----R-INKLLNLLPKLY-GIHRKN-VLECLI-AHSATM-----EDI	2381
MUDCRAB	-----RV-MNRLLSVLNPY-GIFCTR-VLECLA-SYSSSM-----EDI	2378
TARDIGRADE	-----V-QARILFLMPTLP-GVIKAH-GLDVL-AGADAM-----ADP	2453
HYDRA	-----R-ISQLLYCTSMMF-GTLKTM-CLICLA-SRTEQL-V-----NEQOTI	2322
SALPINGOECA	-----H-VORLLFLAPSLP-GQFKTM-ALETLL-WRAEDI-----PDL	2409
SPIDER	-----N-KT-IPHLLFLYSRVH-GIYKNY-ILEIFY-SRVLEF-----ENS	2392
LIMULUS	-----D-R-LQKLLFLPKVH-GMFKTH-IMEVVA-SRVEYI-----QGG	2398
SCORPION	-----SS-LNKLLYMLPKVH-GIFRKG-LEELIN-SHVENI-----ENA	2379
ROTIFFER	-----R-MTKLVFELPQLY-GDFKVM-CMELL-SIRVLL-----QDP	2384
CLIONA	-----N-VSAVGLLPMKH-GDLRTP-CYELIN-QRASHI-----EDL	2413
OCTOPOUS	-----S-LPKLLYHLLPKLH-GDFQLY-CLIEILL-GNINNV-----DGA	2353
CAPITELLA	-----R-IHKVLFMLPGLY-GVFRTY-ALELIA-AGIENI-----EGA	2407
LIMPET	-----R-LNKLLFMLPNLH-GEFRSL-CLIEVH-GRIGOI-----DNV	2383
SCALLOP	-----K-INKVLFMLPKMH-GEFRSL-SLEIHH-GCIESI-----DNV	2441
LINGULA	-----R-MNKLLFMLPRLH-GEYKRH-CLIEVIS-SRVQNM-----ENA	2407
OYSTER	-----R-MNRLLFVLPNLH-AEFRNR-CLIEVL-TRIDTL-----ENV	2405
SNAIL	-----R-LNKLLFMLPGLH-GEFRVQ-CLIEVIM-GCIEQL-----DDA	2405
SPONGE	-----R-VEKLLFLLPSLQ-GVFRSS-CLIEILD-TQADVQ-----PQF	2438
PRIAPULA	SDRYLGQVCGDR-----MSKLLFMLPSLQ-GSFRSQ-CLIEVIL-TRVAHT-----QNL	2451
DANTIO	-----R-INPVFYLLPKLH-GMLKTH-CLIEVIL-SRADVI-----PEI	2420
ESHARK	-----R-LWQVYLLPKLH-GVLKTH-CLIEVIM-HRAEDI-----IDI	2421
BHARK	-----R-MNAVFFLLPKLY-GILKTH-CLIEVIM-YRAEEI-----PDI	2416
XENOPUS	-----R-MTIVLFLPKLH-GVLKTH-CLIEVIM-HRAEDI-----PDL	2432
STERLET	-----R-LNAVFLPKLH-GVLKTH-CMELIM-SRAEEV-----TDI	2434
GAR	-----R-VNAVFFLLPKMH-GVLKTH-CLIEVIL-SRAEEI-----PDV	2423
HUMAN	-----R-MNAVFFLLPKFH-GVLKTH-CLIEVIL-CRVEGM-----TEL	2411
PLATYPUS	-----R-LNAVFFLLPKLH-GVMKTF-CLIEVIL-CRAEEI-----TDL	2415
TASDEVIL	-----R-MNAVFFLLPKFH-GVMKTL-CLIEVIL-CRAEEI-----HDL	2417
COELACANTH	-----R-MSVFFLLPKLH-GVLKTH-CLIEVIM-SRAEEI-----PDI	2422
CAECILIAN	-----R-MTVVFLPKLH-GVLKTY-CLIEVIM-CRAEEI-----PDL	2424
CANARY	-----R-MNAVFFLLPKLH-GVMKTY-CLIEVIM-CRAEEV-----PDL	2413
OSTRICH	-----R-MSAVFFLLPKLH-GVMKTH-CLIEVIM-CRAEEI-----TDL	2383
GECKO	-----R-MNAVFFLLPKLH-GVMKTY-CLIEVIM-GRAEIG-----PSL	2422
TURTLE	-----R-MNAVFFLLPKLH-GVLKTY-CLIEVIM-YRAEEI-----TDL	2422
ALLIGATOR	-----R-LNAVFFLLPKLH-GVLKTH-CLIEVIM-CRAEEI-----TDL	2380
APLYSIA	-----R-LSKLLFLLPNLH-GEFRPA-CLIEVIL-GHVDQM-----EDA	2442
TRICHOPLAX	-----R-VNKVFLMPSLY-GEFKTK-CLIEVIL-ARADHI-----KEL	2400
SOFTCORAL	-----G-INQILFVQVHVH-AQFKTL-CLIEVIL-SRVGVI-----PNL	2419
STONYCORAL	-----R-VNQILFTLPSVH-GDFKSY-CLIEVIL-SRVEHI-----PNL	2448
SEA_ANEMONE	-----R-MKHIMFHLPTH-GVFKAQ-CLIEVIL-SRVSDI-----PDL	2410
SEACUCU	-----R-LNKLLFVLPSTY-GAPRVQ-CLIEVIS-SRVEKI-----ENV	2418
LANCELET	-----R-VSKLLFMLPKLH-GIFRTH-CLIEVIR-GRVNI-----DNL	2447
STARFISH	-----H-TNKLLFMLPSLH-GQPKTL-CLIEVVA-SRVSHI-----PNI	2457
SEA_URCHIN	-----R-MNKLLFMLPSLH-GQPKTE-CLIEVIT-ARIEHI-----DNA	2443

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----LHCPNQLD--K-----IDQKYGVDRDIGIVKTYGNILKLLHE	2408
TETRAHYMENA	-----IQLMRIHS--I-----LKQFYERHYQEKFATAYTYIVVNLVD	2520
STYLONCCHIA	-----DKLMQRVLP--R-----LKQLFQHNKNDYSGLFYDLMVLYD	2486
APHANOMYCESa	-----TA-DMH-QVLL--DG-----DAAVTAFES--SEP-CRMKVLID----FL	2276
APHANOMYCESa	-----SE-DYQ-MVLL--SG-----DCSVLFAPEN---ESQCMKVLQ----FV	2218
PYTHIUM	-----DT-SVA-CRFIMREDQG--GIDLFQDITVRERDTPVRRIFDYDAKKLYQ	2422
PLASMOPARA	-----TM-SEL-NRLVASTSEG--GFDLFRYIQGHALSVCRGLLFSIAKNLYH	2404
BREMIA	-----TV-SEI-DRLVANALEG--GIDVFRHYEGHTS--EERALLFTLAKELYH	2389
AEDDES	-----SG-ENL-ENLE--N-----IVSMGTGNDRADVRIIVEILIFLQE	2462
MIDGE	-----KN-DEI-ESLMN--D-----LMPLVNSPRDVRRIYEMMIFIVE	2419
BOMBUS	-----PP-PNI-LSFTT--L-----VPPYTKHKLSETRELAYSIFIMIKY	2324
ANT	-----VP-TDL-LPYM--L-----VIPVXDSITRELEVIDIMKIYK	2354
WHIPWORM	-----ST-AQI-EELNR--V-----LSSVSHPLANSRCRFAELCCSMD	2388
TRICHIANELLA	-----TV-ENI-SDLNS--S-----FSSVIGNFSPSCRRAFAEMCCSLYT	2407
BEETLE	-----AP--TP-PEIVQ--S-----VCKNVSNINVLCTKVVDDVMAL--	2312
BARNACLE	-----SA-GQW-ARFLP--A-----IDFVVNHGGAPGRLAELCIELRR	2341
THRIP	-----QD-SEL-DEVIH--H-----ISPINCYVKGEARNLVEISLIAFD	2357
FLEA	-----QN-DLN-RPGLIQY--Y-----AKRLISSEDTNCRSVVDIAMTSYK	2359
WHITTEFLY	-----LP-TDL-QKVIIVAF--Y-----LNLVSSSKRDESKLIFETVSILYS	2433
TICK	-----TE-EDW-GATLP--V-----VCOLOGHTSGACRKLIVDVCMLYA	2388
TERMITE	-----KP-EQL-EELVH--E-----ICKFETQRSVKCRSMVEILKWIYD	2439
DAPHNIA	-----EV-EEW-KPLMP--T-----LIRLSRHQNVRECRSLDEVFKAFD	2268
OSTREOCOCCUS	-----VATIESSLH-KQWSALTE--A-----DSAVDTESVNVREAHKMCIAVAE	2431
STENTOR	-----NP--SIKKHV-SGILP--N-----LSSVASASSKDELLEEVQKAYD	2193
KLEBSORMIDIUM	-----SREAVE-TVLP--I-----LCPVPSRHDNPECRNFBFLELFR	2591
CLUBMOSS	-----ADPNST-QKXVL--E-----TCDAVHYHTEERLQYQMLMPLYE	2358
MOSS	-----NQDTR-TRVLP--V-----LCDNFNGHENVDRCRFBYELIYLFPK	2481
LIVERWORT	-----PDQSIH-EKVLH--V-----VCETFTHESVDRCRLYYDLLICLHA	2512
LIGNANO	RLADAQAIAIKQR-VWLLA--AVGEMCLASTGAGAGSVAALTPQARRJAYQILATWYP	2638
COPEPOD	-----DV-GVR-KEYYE--L-----LKDFTSKSYTEQRKHLVEIFKDG-Y	2373
GLOBOSUM	-----SH-SQT-AKFLG--L-----AVDLFSIHGSDRVAAPFPMIFKKE	2343
PALUSTRIS	-----RN-EDV-SYFLA--T-----ALETFSGHPSAKCRSAFYTLMMRLHE	2404
NEOCALLIMASTIX	-----SI-NQI-KFFLN--N-----S-NHFIKHSSLRCRNIYALKYIYQ	2482
GLOMUS	-----EV-STP-EYFLD--G-----LIESFQDHPNNDRCRRIYITILVRMYN	2540
LOBOSPOR	-----KV-DQI-LYFLD--T-----IVLEFSHHPSVCRKLYSILMTLFD	2470
SYNCEPHALASTRUM	-----SS-DMI-SYMLD--T-----LVDIKAKHVNDRCRLYFSLKRCYD	2450
FUNCTIVORUM	-----GDN--DI-KPL-LEAV--K--S-----PVTR-----TTSQKVMELMELLYE	2464
HALBUM	-----TDQ--TL-LQI-INLAL--D--C-----R--RNQSPNETRLLYDIPMWHID	2567
DUPURPUREUM	-----PVS--TI-GQI-LQLLL--L--N-----NSFTSNITSEYRSLEFYDIVIYYN	2572
PVIOLACEUM	-----DSS--QK-QQL-VNLLK--E--Q-----HGLLSSTTNEHCRLLYYEMIMYIYH	2567
AMPHIPOD	-----TA-SQV-LTFLP--F-----LVSLFKHPVSSCREVVTSLTFLHD	2480
SHRIMP	-----TP-SQL-LYFMP--G-----VVAFASHPAPSCEMVDLFWVYD	2452
MUDCRAB	-----TP-SQV-LYFLP--G-----ITGFASHPGAKCREMVDLFWIYD	2449
TARDIGRADE	-----SA-SDL-AEVLL--E-----MVDLGSHGSPLMRQKYEFECMYLYE	2524
HYDRA	-----SL-EQL-LPILK--K-----IEPLQKSFVVKREIVKIFMKCFD	2393
SALPINGOECA	-----NA-SSI-KQFLP--S-----VTANCCSHDDYVRAIAYDILMAVYD	2481
SPIDER	-----SC-DDI-LHILP--S-----IVGHTQPNSHRLALFKILFLFFE	2463
LIMULUS	-----TS-DM-L-LEVLP--M-----IILKLSQQNPLTREVMIQILMDVYA	2469
SCORPION	-----DI-DRM-LNVFP--I-----ISKVHKSAPTECRKVMELMHAYE	2450
ROTIFFER	-----TD-EDL-DRIMP--H-----LEKFIHPHLSRQYVILLISLYE	2453
CLONA	SPTDQ--QY-KIV-LQFLP--E-----IFKVPKSHSNPKRKBAL-ELAMWLYD	2496
OCOTOPUS	-----KP-NEL-AEIFS--S-----INHQKEEPWVACRKLVDILMWVYD	2424
CAPITELLA	-----EA-SQL-LYLLP--A-----ICEISDLSSVLCRKVMQILMWVYD	2478
LIMPET	-----KS-KEM-SSLMD--S-----ITAFSHHPSTLCKRVMELLMWIYD	2454
SCALLOP	-----EA-KEL-MSLLP--L-----VTAFSSHPSTSCRTIMVDLMWVYD	2512
LINGULA	-----QP-DEV-LYFLP--A-----VTAFSSSPSMCRGLMVDILMWIYD	2478
OYSTER	-----QP-SEV-SELPL--L-----ICGFCVSPSIPCRNVMVDILMWVYD	2476
SNAIL	-----SA-TEL-OTFLP--A-----ITGFSNHPSVTQRIIMMKILMWTYD	2476
SPONGE	-----TN-DQL-SEIVP--I-----LIASFSGKHSIQCRIVLNLNLMRVYN	2510
PRIAPULA	-----SP-GEL-LFLPL--A-----VTSIGTHPKAPCRQLMVDILMWVYD	2522
DANTO	-----KP-EEL-KEILG--A-----VTAFAHSPSPVCRKVMVDILMWIQD	2491
ESHARK	-----KA-EV-KVFLV--P-----VIAFISHSPSVCRKVMVDILMWIYD	2492
BHARK	-----KS-AEL-KEILL--S-----VVAFISHSPSIPCRKVMVDILMWIYD	2487
XENOPUS	-----TP-AEL-HEFLI--P-----VTAFFSSHSPVCRKVMVDIPMWIYD	2503
STERLET	-----KP-VEL-KELLI--S-----VTAFTTHSPVCRKVMVDILMWIYD	2505
GAR	-----KP-VEM-REMLG--A-----VTSFVTHSPVCRKVMVDILMWIYD	2494
HUMAN	-----KP-VEL-RELLN--P-----VVEFVSHPSTCRKVMVDILMWIYD	2482
PLATYPUS	-----KP-GEL-RELLN--V-----VVEFISHPSVCRKVMVDILMWIYD	2486
TASDEVIL	-----KP-VEL-QEILLN--C-----VVEFISHPSVCRKVMVDILMWIYD	2488
COELACANTH	-----KP-VEM-KEFLV--A-----VTGFIHSPSTVCRKVMVDILMWIYD	2493
CAECILIAN	-----KP-MEL-GELLN--T-----VVTFSHSPSMCRKVMVDILMWIYD	2495
CANARY	-----KP-LEL-KELLP--G-----VTGFIHSPSVCRKVMVDILMWIYD	2484
OSTRICH	-----KP-LEL-KELLP--G-----VTGFIHSPTVCRKVMVDILMWIYD	2454
GECKO	-----TP-AEV-QELLP--T-----VTGFIHSPSLCRKVMVDILMWIYD	2493
TURTLE	-----KP-LEL-RELLP--G-----VTCGFIHSPSVCRKVMVDILMWIYD	2493
ALLIGATOR	-----KP-LEL-RELLP--G-----VTGFIHSPSVCRKVMVDIMMWIYD	2451
APLYSIA	-----SP-AEL-LSLLP--S-----VKSFSSHSSSACTVMLEVPWVAYD	2513
TRICHOPLAX	-----DI-SQI-LYLAE--L-----VATFKTNPSAACRKMVGIFMWIYD	2471
SOFTCORAL	-----SV-GDI-OTLPL--S-----VTFDLSKSVACRGLMVDILWIYD	2490
STONYCORAL	-----TI-PEL-KFIFP--L-----LTSFVSHPNLLCRDLMVDIFWIYD	2519
SEA_ANEMONE	-----KM-SEI-EYVVP--S-----IATMATSSSTAACRELYDIFMWVYD	2481
SEACUKE	-----SP-AEL-TTLLP--D-----VEAFTSVSSIGCREVMVDIFWIYD	2489
LANCELET	-----KV-EEL-LYLLP--S-----VAAFAHSPAPECRKVMVDIMMWIYD	2518
STARFISH	-----KP-DEI-LYLLP--P-----VRTVFNLPSPACREVMVDILMWIYD	2528
SEA_URCHIN	-----KP-SEL-RYLLP--A-----VKDFVSHPSPSCRKVMVDILMWIYD	2514

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	YLINYDH-----KELQGVTTYILSLFSSQH-IEIRN-----	2439
TETRAHYMENA	YLINQESDLKDKQINSESEEMNQFSQVKSCLLCLFSSQH-NTIRE-----	2565
STYLNCHIA	-----QFENFKPLVKSALIRCLSDRT-KVVRN-----	2513
APHANOMYCEsA	LATTK-----GGVNVQRIILKALADAN-ADVRG-----	2304
APHANOMYCESe	ISIDK-----LSVPAVQILSLKALSRI-ADVRE-----	2246
PYTHIUM	KNLDE-----PLKDRLRALLQGLADPD-ISIRT-----	2450
PLASMOPARA	KDISD-----PGKLRVRSLLHGLADPD-EILRN-----	2432
BREMIA	IGISD-----QSKSKIKVSLHGLADPD-ASRRK-----	2417
AEDES	NSTP-V-----LSSESQKLRALLAGSDPE-QSIOQ-----	2493
MIDGE	RFKSDE-----MSSLIRKKAIEIILKPTDNN-VEIRN-----	2451
BOMBUS	KYFGD-----SSGNNE--IKELMQISKELIINGLDPT-ETLQE-----	2360
ANT	RYSTD-----ITADDVVQNLLSISVQNLVGLDPS-HLOLD-----	2392
WHIPWORM	KLRSFI-----LSADSSLEVKSAMESLTHEHSLLDKKE-EPVRO-----	2428
TRICHINELLA	KLSSLN-----DSENSKAALATTKMHLLTMLSDSN-KSIRQ-----	2443
BEEBLE	-----CETGILPEVKPVLVQGLDDED-TEIRE-----	2338
BARNACLE	RFRD-----D-SEEAAGVRARATDALLVLLDAD-LTVRO-----	2375
THRIP	RYLPMHE---SNKL-SEIEKKIFDESKALLLLGLSDSN-ADLQK-----	2396
FLEA	IIQFK-----SDYDILQNVQYIILLLGLDSD-AQMDN-----	2390
WHITEFLY	RYCNN-----PALEDNIKNRCKELIIRGLVDRN-AEIQK-----	2466
TICK	KYR-S-----KTSAAGLAKQSKHVLVGLDPE-DSLRL-----	2420
TERMITE	HCQ-D-----IGGVLEIEAKGILLKGRDD-PhLDQ-----	2469
DAPHNIA	LSGSHDS-----EFAQAVLTKQSDQD-EELAV-----	2294
OSTREOCOCCUS	AFPGLVN-----EASLARGPLQGLDPPVSTFCRD-----	2460
STENTOR	ESKMDGE-----SIKRSKAREVLLKGLDR-ES-D-----	2423
KLBSORMIDIUM	PAPDKG-----MPHPQOVORHLLGLDPA-BELRE-----	2622
CLUBMOSS	----TKK-----LPHDSRIARFVNLGLDVA-DSVRO-----	2385
MOSS	----NKG-----MDKERLVIQSLMLGLDSS-DIVRA-----	2508
LIVERWORT	----IEG-----LKSNDLLIRSLLAGLSDA-EIVRS-----	2539
LIGNANO	THPN-----LCAPALLAGLSDA-ESNRA-----	2661
COPEPOD	--LDPT-----NADLKSVCLEQLMGLDTD-EGLSE-----	2402
GLOBOSUM	SPAVEH-----DAVLKRLVKYSLKGLSDS-NGIRS-----	2374
PALUSTRIS	RTDL-----EAKINRVLKLALGLDPT-EEIRG-----	2433
NEOCALLIMASTIX	VNM-----DEEIKNSVKSLLGLDSD-EEIRN-----	2510
GLOMUS	KING-----TVEIKHKLKINLIRGLDTD-ESIQO-----	2569
LOBOSPOR	KHST-----TPEVANVLRVQLIRGLDYN-ESIRH-----	2499
SYNCEPHALASTRUM	TLMD-----DSPLKIRINSEILKGLDGD-KTIQQ-----	2479
FUNCTIVORUM	KDPLVRS-----C-EQ-----DLTSQILMGLDE-ESISN-----	2492
HALBUM	YLEKDVII--D-QN-----QIRLTLILGLSDS-EAVKR-----	2596
DUPURPUREUM	-NPFSEFQ--D-DK-----QLILSLLILGLDEG-ESINK-----	2600
PVIOLACEUM	QNFNDAD--Q-DR-----DILCLLILGLDES-EMIGK-----	2596
AMPHIPOD	RYQCESS-----EDQKEVYCTVHDALLQVAD-TELNR-----	2514
SHRIMP	NFSNNDT-----EDGHQLESQARGVLLRWKED-AALRQ-----	2486
MUDCRAB	NFRESSD-----SEGSQIEAKTRVSLGLVAKED-AALRQ-----	2483
TARDIGRADE	RFENSTV-----ADEQTLQLIIRTRLPGLKDRD-KTIKD-----	2558
HYDRA	HFKEKRE--E-ETSKLILQICKETLLVGLDRN-TDLNL-----	2428
SALPINGOEA	QKLSHERGDV-VLADDETAALTEIAQLARTHLLGLDSS-PKLR-----	2536
SPIDER	KFSDSSG-----AKEKEITRYSRETLGLDPP-PSIRL-----	2497
LIMULUS	NFSMKSQ-----AKEKEITRILAKETLLGLDQN-IALLRLLVNNFWSNPSRLPS-----	2517
SCORPION	KFNFKWG-----IKEKEISRIAKEMLLGLDSD-LTLRLTVHNFWSQNNHLPA-----	2498
ROTIFFER	TYQFKVNI--QI-----QSITSQILMFKENLLGLDDED-TSIRV-----	2489
CLIONA	HOKSLS--ST--DQHSIMKLSKIFALKGLDPE-ELLRN-----	2531
OCTOPUS	NYGEETS-----EESQIMSNTRELILKGLDQD-YSCRI-----	2458
CAPITELLA	NYKDEA--QS-----ESRDEIITLTKDVLRLGLDSD-LTNRL-----	2513
LIMPET	NYREDE--C-----TEGHEIMLTKKELKGLDDED-MMCR-----	2488
SCALLOP	NYRGDD--N-----EDAHI IQQTKEGLLGLDDED-LHSRL-----	2546
LINGULA	NYRDEN--N-----ATVHQIMSRTKDALNGLSDK-LGLRL-----	2512
OYSTER	NYREDE--S-----ETADTIMQQTKESSLKGLDDED-MQCR-----	2510
SNAIL	NYRDNE--S-----KEGQEMKVTQESLLGLDQDN-LHCR-----	2510
SPONGE	KLCTDDQ--SESD--DSVKMIRSIRDQLLGLDDES-NEVRL-----	2548
PRIAPULA	SYRDSEG-----EEDKLASLARDSLGLDSD-DSLRL-----	2556
DANTIO	NYSDSE--SRSD--STSVEVLSVARETLGLDQDEN-YGLQL-----	2528
ESHARK	NYRDAE--SQSD--PDSKAVFVTKDGLDQDEN-PALQL-----	2529
BHARK	NYRDPE--SQSD--PDSKEIYVTSDALGLDQDEN-PALQL-----	2524
XENOPUS	NYRDHE--SQND--SKSVEVFNMAKEGLGLDQDEN-TELQL-----	2540
STERLET	NYRDPE--SQSD--SVSTEVFNLAKETLGLDQDEN-QGLQL-----	2542
GAR	NYRDSE--SQSD--SDSLEMLNVAKETLGLDQDEN-QGLQL-----	2531
HUMAN	NYRDPE--SETD--NDSQEIFKLAKDVLGLDQDEN-PGLQL-----	2519
PLATYPUS	NYRDPE--SQAD--EESREVFKLAKELGLDQDEN-HGLQL-----	2523
TASDEVIL	NYRDLE--SQTD--EVSQEVKLAKAVLGLDQDEN-LGLQL-----	2525
COELACANTH	NYRDQE--SQAN--NESREVLKASEVLLGLDQDEN-PGLQL-----	2530
CAECILIAN	NYRDPE--SQAN--DDSQEVFSRANDVLLGLDQDEN-AGLQL-----	2532
CANARY	NYSDPE--SQAD--DDSREILKVAKEVLLGLDQDEN-AELQL-----	2521
OSTRICH	NYSDPE--SQAD--GDSQEVKLAKAVLGLDQDEN-AELQL-----	2491
GECKO	NYRDPE--SQAD--EKSSEVFLAKAVLGLDQDEN-SGLQL-----	2530
TURTLE	NYRDPE--SQAE--EESQEVFLAKAVLGLDQDEN-SGLQL-----	2530
ALLIGATOR	NYRNSD--SQAD--EDSQEVFKAVKEMLGLDQDEN-SELQL-----	2488
APLYSIA	NYRAGED-----EESHVRMSLTKEALLRGLDQDEN-LACRL-----	2547
TRICHOPLAX	TRQEID--KNDE--TKQLINFCQDQLGLDQDEN-EEENRL-----	2507
SOFTCORAL	TYRFDET--FKNEDSEGSVDLRCRTKNVLLGLDQDEN-KEMRL-----	2530
STONYCORAL	SYRADEA--FQAE--EGSADILADAKHLLGLDQDEN-RDLQL-----	2557
SEA ANEMONE	TYRSDET--FRNE--EGSEEILATAKDYLLRGLDQDEN-KILKL-----	2519
SEACUKE	HYRDEV--RMEE--EGVPKVLGMADALLGLDQDEN-PYLRL-----	2526
LANCELET	NYREEA--SQQE--S-AGRVLTAKDCLLGLDQDEN-SYLRL-----	2554
STARFISH	NFRDEE--SRTE--DGADDILCMADKTLGLDQDEN-ASHRL-----	2565
SEA_URCHIN	NYRDED--KREG--QDGDEALSIAKDTLLGLDQDEN-NYLRL-----	2551

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----LCF K Y L ODDLERKAIQL	2456
TETRAYMENA	-----NTFK L LDRETN	2576
STYLONCCHIA	-----KLI S FNSDSSR	2524
APHANOMYCEsa	-----KVAS S VEA-H	2313
APHANOMYCEse	-----RAY E FWEK-Q	2255
PYTHIUM	-----EVL T FCNGSEL	2461
PLASMOPARA	-----EAY N FNSFAS	2443
BREMIA	-----EAF D FNTSAI	2428
AEDES	-----RMF D FVTNESR	2504
MIDGE	-----RVAN F LSLDNE	2462
BOMBUS	-----MLL N FVTQDAK	2371
ANT	-----KIL K FVTEETS	2403
WHIPWORM	-----IVF N FVNDKDR	2439
TRICHINELLA	-----LVY N FVCDASR	2454
BEEBLE	-----RVY N FVRNNS	2349
BARNACLE	-----TAAN V ADAGA	2386
THRIP	-----KSF S KVTDDEER	2407
FLEA	-----KMQ T FVQSENA	2401
WHITEFLY	-----SLY E FVMKDNV	2477
TICK	-----SVAN F VSQETQ	2431
TERMITE	-----SIF E FVNSDAQ	2480
DAPHNIA	-----KMQ N FVLAEK	2303
OSTREOCOCCUS	-----SALA N VNTRLQ	2471
STENTOR	-----GIM K FVHDH	2234
KLEBSORMIDIUM	-----EAG F FVGLQ	2631
CLUBMOSS	-----SLQ F FVDAQ	2394
MOSS	-----SLQ N FVHLQ	2517
LIVERWORT	-----TVQ K FVSSI	2548
LIGNANO	-----WLL E FVSRNSG	2672
COPEPOD	-----FCS N FVNLFL	2413
GLOBOSUM	-----SLL E FVNSKVF	2385
PALUSTRIS	-----AVT S FVLRQGG	2444
NEOCALLIMASTIX	-----NIL S FVHDS-S	2520
GLOMUS	-----ALIE F VHAQEE	2580
LOBOSPOR	-----TVVE F VYSKDR	2510
SYNCEPHALASTRUM	-----TVVE F VEARHG	2490
FUNGIIVORUM	-----KLL F FVLDRL	2501
HALBUM	-----KLL E FVDTSK	2607
DPURPUREUM	-----KLL E FVDNNTKT	2612
PVIOLACEUM	-----KLF E FVDNVNS	2608
AMPHIPOD	-----FILD F VTRRAQ	2525
SHRIMP	-----IVL R FVLQGAR	2497
MUDCRAB	-----TVL R FVLERFQ	2494
TARDIGRADE	-----LLT A FVAQEK	2569
HYDRA	-----VLL N FVVRKE	2437
SALPINGOECA	-----SIV A FVDQEK	2547
SPIDER	-----IVD N FVSNEK	2508
LIMULUS	ATKERFLTLQQMYSPPTEDKFLEYGTFLMSSDECFTLYISLIVD N FVSNEKR	2571
SCORPION	ETFSRIKAVLQKMYSPETIEHM-----FSSDECFTLYISLIVD N FVSNEKR	2543
ROTIFFER	-----MAG F FVTEKAD	2500
CIONA	-----RAM N FVSDES	2542
OCTOPUS	-----LVH N FVSNRTR	2469
CAPITELLA	-----TVQ N FVSHETR	2524
LIMPET	-----LVQ N FVSSDTR	2499
SCALLOP	-----LIQ R FVSSETR	2557
LINGULA	-----RVM F FVSHESR	2523
OYSTER	-----LVQ N FVSSETR	2521
SNAIL	-----TMQ N FVSSESR	2521
SPONGE	-----KMY E FVNQESN	2559
PRIAPULA	-----IVT N FVSHATR	2567
DANTIO	-----YVR N FVSHESR	2539
ESHARK	-----YVR N FVSHENR	2540
BHARK	-----YVR N FVSHENR	2535
XENOPUS	-----IVR N FVSDETR	2551
STERLET	-----YVR N FVSHESR	2553
GAR	-----YVR N FVSHETR	2542
HUMAN	-----IIR N FVSHETR	2530
PLATYPUS	-----IVR N FVSNETR	2534
TASDEVIL	-----IIR N FVSHETR	2536
COELACANTH	-----YVR N FVSDENR	2541
CAECILIAN	-----TVR N FVSDETR	2543
CANARY	-----IVR N FVSHETR	2532
OSTRICH	-----IVR N FVSDETR	2502
GECKO	-----IVR N FVSDETR	2541
TURTLE	-----IVR N FVSDETR	2541
ALLIGATOR	-----VVR N FVSDETR	2499
APLYSIA	-----MCQ N FVSSNTR	2558
TRICHOPLAX	-----QLI N FVSNMNR	2518
SOFTCORAL	-----KLR N FVSDETR	2541
STONYCORAL	-----KLR N FVSEAR	2568
SEA_ANEMONE	-----KLR N FVSDETR	2530
SEACUKE	-----RIN N FVSHENR	2537
LANCELET	-----LVQ N FVSHETR	2565
STARFISH	-----RVS N FVSHETR	2576
SEA_URCHIN	-----RVS N FVSHETR	2562

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	QYQAGQ-QTTQIDRVISIMKD-I-----	OPSK-PTLWLNKAVPLLLSQ	2498
TETRAHYMENA	----D-SKTPYERLLYLQIE-I-----	QPBO-ERLWLLAVPLIMCLG	2613
STYLONCHEIA	----L-GLDNPORLLOIMND-I-----	YQEE-ENIILNNSVFLIMQIT	2561
APHANOMYCEsa	----L-PSSCDRLRALFGQ-L-----	HQET-DEWVRVAVPLWLSL	2350
APHANOMYCEse	----L-PSSCHDRLLALFGP-L-----	YHDQT-FEDWVWVAKLWLSL	2292
PYTHIUM	----L-PGSCDRVLELYQS-M-----	APGV-EDVWLLAVNIMLGL	2498
PLASMOPARA	----I-KKSCFRLLSIFGS-L-----	HSSSEL-DENWLLAVNILLGLS	2480
BREMIA	----A-MNSCSDRLALIFGS-L-----	SPDF-DDRWLLAVNILLIGMS	2465
AEDDES	----F-PTDIDNRRFRVLSL-D-----	EPSP-BAVYLGAVNILLDSN	2541
MIDGE	----L-FKDFIGRFVLEK-F-----	DPNI-GRFTHSGLLLDLS	2499
BOMBUS	----L-TMTCR-ERLLENVDI-I-----	TPNA-BKNTFP-HELLITDIL	2407
ANT	----L-STEKSDRLALLAMHS-----	RYTTE-VDAATVQLMMQLT	2442
WHIPWORM	----L-SHRSAAQLNVL-G-L-----	SRSP-KDGLGASVPMFYLS	2475
TRICHIANELLA	----L-EISTSARLLNCLSQ-L-----	TCMT-ESTLHSAVYVMLEL	2491
BEETLE	----V-PHPVAVRFLYLKFN-F-----	EEST-ENDFLGCYFLLERL	2386
BARNACLE	----D---TTPRLSRVLT-D-M-----	RPGL-BAVYLSVAVYLVGL	2421
THRIP	----L-PQNVARLSTMPFL-L-----	SPLT-BOYFLSVCPPLLAG	2444
FLEA	----L-PKTYDAIFKYLMSN-L-----	DEHL-EKNFIQNGVITLLQL	2438
WHITEFLY	----L-PEKSIDRLRFVLSN-M-----	IRDI-BYAVLGCNLPVLDON	2514
TICK	----L-PLKARERLVALLAG-M-----	SPET-EDHFLSSVPLLEL	2468
TERMITE	----L-QRDASTSDRLFLITD-L-----	CPAT-EHIFLGSVQYVLEAF	2518
DAPHNIA	----L-PNGTMDRLAYVTD-F-----	SPGA-RDYFLPGLHFLERL	2340
OSTREOCOCCLUS	----L-YDSLFAKQDVLNL-I-----	PKKV-BSLWLAARLMPAVD	2507
STENTOR	----L-SLEAGHRLCQSEB-I-----	TPPC-ERLWVLSHLLWKL	2271
KLEBSORIDIUM	----L-SQEMPARLVELGR-L-----	EPPE-EDKIQAGSBRMLMLG	2668
CLUBMOSS	----L-PENMMERFSHVLSN-M-----	HLPT-DHSHPTSNVLLKLL	2431
MOSS	----L-SQDVRRHFLVLRN-I-----	DPCL-BENNAQISVLLKLL	2554
LIVERWORT	----L-SQNLRELSQMLNL-M-----	DPSV-BENNAQISVLLKLL	2585
LIGNANO	----L-PSEASARWFALLSR-CHGNNTADESDNRDEE	SAST-AVAVLPAFSAVLLDAG	2724
COPEPOD	----S-SGDSLDRMRNLHQ-M-----	YFHEH-FALLALFASILLDA	2450
GLOBOSUM	----V-NQTVFDRAMDVCD-W-----	IPEV-EDSFLKSVLPLDAG	2422
PALUSTRIS	----MQQGDIFRTEFLIGS-L-----	EPEV-BSSVLSVPLFLDVA	2482
NEOCALLIMASTIX	----L-VDSVTFDFRVLNS-L-----	SSET-SSTVLSVAVPILLLSL	2557
GLOMUS	----L-SHNTFKLKLKELIGN-L-----	STES-ENLFTNAGYVLLGEGS	2617
LOBOSPOR	----L-PSNTFERLGEIIRN-M-----	DVQA-EDIFLNAGYVMLLDR	2547
SYNCEPHALASTRUM	----L-KEEIFDVIGPST-A-----	TPSV-BMMVLLGAYLLES	2527
FUNCTIVORUM	----L-PEKSDRILYALQA-M-----	TPPT-ETHVHSHLLMKL	2538
HALBUM	----L-SLSVTVRLMQLFEK-M-----	TKET-SRQLGCSLLLOL	2644
DUPURPUREUM	----L-SSNSNRQLQFFTI-M-----	SPET-BKNGRNCCLLLQL	2649
PVIOLACEUM	----N-P-STIARLIQLFTT-M-----	APET-BGKWSLSCCLLSL	2644
AMPHIPOD	----L-SLSPHELIVFLRD-L-----	SVSS-EDTFLHVGVHLLQIT	2561
SHRIMP	----SMTLTCLLHILRK-M-----	SPES-BDSFLQMIYVLEAF	2533
MUDCRAB	----DMVLHDRVHLKLM-I-----	SPET-BDSFLAMVILLEAF	2530
TARDIGRADE	----M-SGSTFMRMLTIFTS-F-----	ITPEL-ETAFLPAGHLLGL	2606
HYDRA	----L-SENTIERFTEILT-F-----	SSKT-EKETSISVNLILQL	2474
SALPINGOECA	----L-ARNPVORFYDILTS-L-----	VVEA-EEAVLQVAVNVLQLE	2584
SPIDER	----L-PLGTVERLIALMKN-M-----	SPVT-BESVLSVPLFLERL	2545
LIMULUS	----L-PLGTVERLIALMKN-M-----	ETL-LOSGVPLFERL	2586
SCORPION	----L-PLGTVERLIALMKN-M-----	LOSGVPLFERL	2571
ROTIFFER	----M-PSNTDRMLLVEK-L-----	SPKT-ERFVLSVPLLEK	2537
CLIONA	----L-PITPIHKVSGIFOD-L-----	DSSLESRRLCANGLLIQS	2580
OCTOPUS	----L-PESTFDRVAVFQM-M-----	SPGT-BHOFLYSSSLLLEM	2506
CAPITELLA	----L-PGETVERIVAMLEA-M-----	TPST-ELHVLAVNLLLEM	2561
LIMPET	----L-PTGTLDRVAMLEA-M-----	SPST-BQVLSVAVNLLLEM	2536
SCALLOP	----L-PPDTLDRIVAMLEA-M-----	APVT-BQVLSVAVNLLLEM	2594
LINGULA	----L-PAGTLERMVAMLEA-M-----	SPSV-BSSVLSVAVNLLLEM	2560
OYSTER	----V-PGNTLDRIVAMLEA-M-----	SPVT-BKQVLSVAVNLLLEM	2558
SNAIL	----L-PDGTVDRMISILEA-M-----	TPGS-BCNVLAVNLLLEM	2558
SPONGE	----L-SSNTLDRITQLVLT-L-----	SKKT-BTQFLYAVNLLLEL	2596
PRIAPULA	----L-PTQTLPRLLAIQTL-L-----	SPAT-BPHVLSVAVYVLLQL	2604
DANTO	----L-PPETLERMLVVLKS-L-----	SSRI-BEQVLSVAVDLLLEM	2576
ESHARK	----L-PTGTHDRMLVILRS-M-----	SNKI-BTQVLSVAVNLLLEM	2577
BHARK	----L-PTGTHDRMLVILRS-M-----	CNKI-BTQVLSVAVNLLLEM	2572
XENOPUS	----L-PSNTTERMLAILSS-L-----	SPKI-BKHVLSVAVNLLLEM	2588
STERLET	----L-PTSTLERMLVILRS-L-----	SSKI-BAHVLSVAVNLLLEM	2590
GAR	----L-PTTTLERMLVILRS-L-----	SSKI-BAQVLSVAVNLLLEM	2579
HUMAN	----L-PSNTLDRLLA-LNS-L-----	SPKI-BVHVLAVNLLLEM	2566
PLATYPUS	----L-PSNTLDRMLA-LNS-F-----	STKI-BMHVLSVAVNLLLEM	2570
TASDEVIL	----L-PSNTLDRLLA-LRS-L-----	STKI-BMHVLSVAVNLLLEM	2572
COELACANTH	----L-PVGTDRMLVILKA-F-----	CNKI-BTQVLSVAVNLLLEM	2578
CABCILIAN	----L-PVVTTDRMLALINS-F-----	SPKI-BSHVLSVAVNLLLEM	2580
CANARY	----L-PTNTLDRMLSLSS-F-----	STKI-BTHVLSVAVNLLLEM	2569
OSTRICH	----L-PANLDRMLALINS-F-----	STKI-BTQVLSVAVNLLLEM	2539
GECKO	----L-PGNTLDRMLTHLSS-L-----	STKT-BTQVLSVAVNLLLEM	2578
TURTLE	----L-PTNTLDRMLALINS-L-----	STKI-BTQVLSVAVNLLLEM	2578
ALLIGATOR	----L-PTNTLDRMLALINS-F-----	STKT-BTQVLSVAVNLLLEM	2536
APLYSIA	----L-PESTLERVSMLEA-M-----	SPST-BPHVLSVAVNLLQAM	2595
TRICHOPLAX	----L-PSGTLERLSSVLYA-L-----	SPNA-BSEVLSVAVNLLLEL	2555
SOFTCORAL	----L-PNSTLERLVQVLRM-M-----	SPIT-BSEVLSVAVNLLHL	2578
STONYCORAL	----L-PGTLERLVEVLRM-L-----	STTT-BIQVLSVAVNLLHL	2605
SEA ANEMONE	----L-PNTLERLVDVLRM-M-----	STNT-BQVLSVAVNLLHL	2567
SEACUKE	----L-PVDTLERMVALLEC-M-----	SPST-BDQVLSVAVNLLLEM	2574
LANCELET	----L-PTGTLERIVAMLEC-M-----	SPRT-BQVLSVAVNLLLEM	2602
STARFISH	----L-PTGTLERIVAMLEC-M-----	SPGT-BHOVLSVAVNLLLEM	2613
SEA_URCHIN	----L-PKETLERLISMLGC-M-----	SPGT-BNRVLSVAVNLLLEM	2599

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	TKQED-DFMFKQLSDEAHYD-QE-FRNKKYIRQNNKQAGQFG-SFT----	2550
TETRAHYMENA	KRSDVD-KNLDQQLSKLAQYD-WD-FRDSHNRMLYNSQPLTLLTLGKVVNYKSG	2669
STYLONCCHIA	QSDFDN-RKIFDAPLDDKQFP-LE-I-NQVGH-QLNRSQPLTLLSQDQIFQASQ	2614
APHANOMYCEsa	TSDFDIA-NMLFPTLSSITQFEP-LE-IDTAVAR---RTQSILTLTFSQDAIALQSQ	2403
APHANOMYCEsa	QASSDNK-QFLFSEPLSSSNFEQ-LA-IDTSVEH---RTQNLTLTFSQDAQALQSS	2345
PHYTIUM	RGSGFD-SLLFNLPLSDGE-VD-AE-IDAAVET---KNETM-TDLTVEADKFSFVS	2549
PLASMOPARA	KEDEFK-OPLFKISLGG-GE-YT-TQ-IDASVEA---KAQSM-ADLTVEADKFWKRL	2531
BREMIA	ENKFEFK-OPLFASLSS-GE-SD-TQ-IDASVES---KQSM-LDLTVEADLASHS	2516
AEDDES	VKNPEFK-RRIHQEYVDVK-LRE-YS-IDTRVRQ---RNSFASAPLVEAQRLFTGG	2594
MIDGE	IRNPQFK-BRLIDYSTRQDQFPE-YP-IETKNSN---KRS-LPFLVQSKOKTLIAG	2550
BOMBUS	KKNNVT-QKIFL-GL-HQSS-VD-YK-IALLKPT---KNFQKAPLAPFLASQMMQT	2458
ANT	TKSDIT-SKMFDAIQSSTI-EK-YK-IDVSR---RNLSCITLHVQVLAASLVS	2495
WHIPWORM	TLDFDT-RLLVDRGLDQDN-ED-MH-VPTHHS---RYAQFVPTMMSKPFKIS	2527
TRICHINELLA	CHDFDT-RLVDRGLDQDN-ED-LP-ISTHQSS---RYASLEVAAMQVHSEVS-	2542
BEEBLE	KPADYS-KLLFEPDLDDN-ED-YY-LETNARA---RYLSV-VLFAEIVRFSMSL	2437
BARNACLE	AQDFDT-RKMDRDLDESE-EE-VA-IVSDRV---QSAAL-VLFSQPAAGG---	2469
THRIP	RSDFDT-SPLSHALDDCE-GE-MH-LTSTRV---KNAHM-ADLACILSGLISLQ	2495
FLEA	LQSDIQ-RNIFEPDLSDOT-FKS-YS-VEDNWHI---KNSAT-VLFAESFIPKMKSR	2489
WHITEFLY	EQLSCR-ENIFDFDLANON-LFE-LP-INAAKRR---QHASF-VLFAADLQRSQSS	2565
TICK	SRDFDG-RKLFEPDLSDCR-FVD-YA-VTGSVRQ---RHAAM-TLFAELVSWQSS	2519
TERMITE	AGDFDN-QKIFEPDLKQD-FED-FR-MLLSARA---QNAVY-APMADTLASGLIQ	2569
DAPHNIA	TQSHLR-EPHIDQLDDVP-QS-FDLISLSQ---TVSTL-RPSVSNFG-----	2383
OSTREOCOCCLUS	QMDASG-ASLIDSLSDQV-TL-YK-VDTLRR---GASPMMLSSSSSLQKQEG	2559
STENTOR	ELDFDN-KVLDRLDGLDGL-QD-AQ-M-NSDFP---RSPFM-TLFAESFIPKMKSR	2321
KLEBSORMIDIUM	EADDFD-RPLDQDLDEP-FSE-YN-IDTAVAR---RSLPMTLFAELVSWQSS	2719
CLUBMOSS	QRVDR-RPINAALDDGE-QE-RQ-IDSSAVG---GSLPM-TLFAESGLSRSMKE	2482
MOSS	EDSVYK-RPISAPLSEV-QD-YT-INTSVG---ASLPM-TLFAESGLSDIQ	2605
LIVERWORT	EDSVYK-RPINAALSDGE-IHE-YT-INTSLG---GSLPM-TLFAESGLSDIQ	2636
LIGNANO	SSDFDR-RPMDRDLADCP-FRE-CR-IDADRR---RHGMLTLLLEMQQQQQK	2776
COPEPOD	ALSPNS-KKVDRLDGLDGH-FIE-YH-VDTNRM---QHSASLMMADLSSQSGS	2502
GLOBOSUM	RLDFMD-QKVDRLDGLDGR-NDKDIVDLLKKN---S-TSM-LDLFAADKASFSF	2474
PALUSTRIS	KEADYQ-TMFDLGLDQDNT-ADASLTDVSLG---T-GSM-QDLFAADKASFSF	2534
NEOCALLIMASTIX	---SDLE-NLFLKNSLPMATL-GKNKK-FNMSF-I---S-SSM-DLFTSSNNKNNYN	2604
GLOMUS	KKSHYN-KPILDQLDQSR-DENYDDITSTRV---N-NTM-TLFAELVSWQSS	2669
LOBOSPOR	KKDFDT-RPILDQLDQSR-DENYDDITSTRV---N-NTM-TLFAELVSWQSS	2599
SYNCEPHALASTRUM	KRDFDG-SLLDQDLDEP-FDEHQNDITSTRV---S-TSM-TLFAELVSWQSS	2579
FUNGIVORUM	ARDFD-RLLDRLDGLDGP-FRE-YN-LETNH---SSM-TLFAELVSWQSS	2578
HALBUM	TRDFDT-KLLDQDLDEP-FRE-YN-LDASQ---RTSNM-NLFAESGLSDIQ	2695
DPURPUREUM	NRSDC-KVLDQDLDESE-KE-VQ-LDSSQH---RTLNM-NLFAESGLSDIQ	2700
PVIOLACEUM	NKDFDS-KLLDQDLDEP-FRE-VV-LDSSQN---RTSNM-NLFAESGLSDIQ	2695
AMPHIPOD	HSDFDY-RPLDQDLDEP-FRE-MK-VCPARA---RHASM-VLFAESGLSDIQ	2612
SHRIMP	RHSADY-QRILDQDLDEP-FRE-MK-VSTARA---RHASM-VLFAESGLSDIQ	2584
MUDCRAB	RYSDYQ-RDILDQDLDEP-FRE-MK-VSTARA---RHASM-VLFAESGLSDIQ	2581
TARDIGRADE	QKSVFRDKLRTALDQD-FK-QE-IATSWQ---RSTM-APLFAESGLSDIQ	2657
HYDRA	SLDFDS-LPLSMGLDDEKTS-SS-FD-VKFSQ---QKASL-TLFAELVSWQSS	2526
SALPINGOECA	KHDFDY-RELFARPLSSST-VRN-YR-VDASVRQ---RNAHM-TLFAELVSWQSS	2635
SPIDER	SYDFDK-RKIFEPDLSDQD-QA-YK-IQTSARK---RHAM-ADLFAELVSWQSS	2595
LIMULUS	SLDFDN-RKIFEPDLSDQD-QV-YN-VSSSRQ---RHAM-ADLFAELVSWQSS	2637
SCORPION	SKDFDN-RKIFEPDLSDQD-QN-YA-ISSSK---RHATL-TLFAELVSWQSS	2622
ROTIFFER	SKDFDN-RKIFEPDLSDQD-FRE-YN-LEADRR---RHSTM-TLFAELVSWQSS	2588
CIONA	SLDFDN-RKIFEPDLSDQD-QE-YE-IDNSRH---QYASL-VLFAESGLSDIQ	2631
OCTOPOUS	SKDFDK-RKIFEPDLSDQD-KE-YR-VKSHQH---RHSTM-TLFAELVSWQSS	2557
CAPITELLA	TKSDFN-RVLDLTLSEK-QD-FA-VSSTYQ---RHAAM-TLFAELVSWQSS	2612
LIMPET	TKSDYQ-REIFEPDLSDQD-QE-FS-VKSSKQ---RHAAM-TLFAELVSWQSS	2586
SCALLOP	SKSDYQ-QRIFEPDLSDQD-QD-YN-VKSSRQ---RHAM-TLFAELVSWQSS	2645
LINGULA	SKSDYN-REIFEPDLSDQD-FED-FV-VKSSKQ---RHAAM-TLFAELVSWQSS	2611
OYSTER	SKSDYQ-REMFEPDLSDQD-QD-YN-VKSSRQ---RHAAM-TLFAELVSWQSS	2609
SNAIL	SKSDYD-QRIFEPDLSDQD-FRD-YS-VQSSRQ---RHAM-TLFAELVSWQSS	2609
SPONGE	SRSDYN-RVLDLTLSEK-QD-YK-IDLSQ---RHLQD-TLFAELVSWQSS	2648
PRIAPULA	SLDFDK-RLVDRGLDQDN-QD-YN-IATSWQ---RHAAL-TLFAELVSWQSS	2655
DANTIO	SHDFDT-RMFEPLSDQD-QD-YT-IDSNRM---RSTVL-TLFAELVSWQSS	2627
ESHARK	SRDFDT-REMFEPDLSDQD-QD-YN-IDSSRQ---RSTVL-TLFAELVSWQSS	2628
BHARK	SHDFDS-REMFEPDLSDQD-QD-YS-IDSSHQ---RSTVL-TLFAELVSWQSS	2623
XENOPUS	SKDFDI-RKMFEPLSDQD-QD-YT-VDSSRF---RSSLV-TLFAELVSWQSS	2639
STERLET	SRDFDT-RDMFEPLSDQD-QD-YI-IDSNRH---RSTVL-TLFAELVSWQSS	2641
GAR	SRDFDS-RAIFEPDLSDQD-HD-YI-IDSSHH---RNTVL-TLFAELVSWQSS	2630
HUMAN	SMSDFP-NPMFEPLSDQD-QE-YT-IDSNRF---RSTVL-TLFAELVSWQSS	2617
PLATYPUS	SKSDYS-RHIFEPDLSDQD-QE-YT-IDSNRF---RSTVL-TLFAELVSWQSS	2621
TASDEVIL	SKSDYS-RHIFEPDLSDQD-QE-YS-IDSNRY---RSTVL-TLFAELVSWQSS	2623
COELACANTH	SRDFDT-REIFEPDLSDQD-QD-YI-IDSNRH---RSTVL-TLFAELVSWQSS	2629
CAECILIAN	SKSDYT-REMFEPDLSDQD-QD-YT-IDSNRY---RSTVL-TLFAELVSWQSS	2631
CANARY	SKSDYS-RKIFEPDLSDQD-QD-FV-VDSSRY---RSTVL-TLFAELVSWQSS	2620
OSTRICH	SKSDYS-RKMFEPLSDQD-QD-FV-IDSSRY---RSTVL-TLFAELVSWQSS	2590
GECKO	SKSDG-RKMFEPLSDQD-QE-FA-VDSSRF---RSTVL-TLFAELVSWQSS	2629
TURTLE	SKSDG-RKMFEPLSDQD-QD-FV-IDSNRY---RSTVL-TLFAELVSWQSS	2629
ALLIGATOR	SKSDYS-RKIFEPDLSDQD-QD-YI-IDSNRY---RSTVL-TLFAELVSWQSS	2587
APLYSIA	SKDFDT-RKVFEPDLSDQD-QD-YS-VQSSRQ---RHAM-TLFAELVSWQSS	2646
TRICHOPLAX	SRDFDK-LSIFEPDLSDQD-HD-YN-VNYSQY---RHAM-TLFAELVSWQSS	2606
SOFTCORAL	QSDFDG-RLIFEPDLSDQD-QD-YE-INFAYQ---RNTM-TLFAELVSWQSS	2629
STONYCORAL	SLDFDE-RLMFEPDLSDQD-FEE-YQ-IDYSQ---RHLAM-TLFAELVSWQSS	2656
SEA ANEMONE	SFDFDE-RLMFEPDLSDQD-FEE-YP-IDYSQ---RHVM-TLFAELVSWQSS	2618
SEACUCIE	SKSDYK-REMFEPDLSDQD-QD-IS-IDSSKQ---RHQINTLFAELVSWQSS	2626
LANCELET	SRDFDS-REIFEPDLSDQD-QD-VQ-IDHSKQ---RHAM-TLFAELVSWQSS	2653
STARFISH	SKSDYK-REIFEPDLSDQD-QD-VT-IDHSKQ---RHLAISTLFAELVSWQSS	2665
SEA_URCHIN	SKSDYK-REIFEPDLSDQD-EG-VQ-IDHSKQ---RHAALSTLFAELVSWQSS	2651

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Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	SS ^{SG} -----I ^{SG} AIGA ^{SG}	2561
TETRAHYMENA	GFALPAPR-----RMYNITGV ^{SG} MPIQEVRATVY ^{SG} SDNS ^{SG} GEMVIPS ^{SG} DQAS ^{SG}	2719
SPYLONCHIA	MQAKDQQLGVIKEVQNPENPDENIAGDVMTI-----DTTVSNRNRRPQIQAS ^{SG} IG ^{SG}	2668
APHANOMYCEs	PLDQP-----	2408
APHANOMYCEse	A-----	2346
PYTHIUM	ATQMGs-----	2555
PLASMOPARA	QS ^{RO} OP-----	2537
BREMIA	ESRQQL-----	2522
AEDES	N-----G-----S-	2597
MIDGE	D-----G-----S-	2553
BOMBUS	FTOMPTFLS-----YMSF-----DSTY	2475
ANT	SFESVD-----YNDLYGTCLT-----PTFSY	2517
WHIPWORM	SMLTPOSVR-----E-----	2537
TRICHINELLA	KFI---SR-----K-----	2548
BEEBLE	QTF-----K-----	2440
BARNACLE	-----	2469
THRIP	DSSSSL-----	2501
FLEA	STATRS ^{SG} V-----YIGSQT-----IAAY	2508
WHITEFLY	SFSD-----	2569
TICK	STTT ^{SG} STT-----	2528
TERMITE	S ^{SG} ---LSG-----	2574
DAPHNIA	-----RG-----	2385
OSTREOCOCCUS	V-----	2560
STENTOR	-----	2321
KLEBSORMIIDIUM	CS ^{SG} APAP ^{SG} -----T-----QTGGR	2734
CLUBMOSS	SLA-----E-----ANASL	2492
MOSS	MHGE-----D-----RDGEF	2615
LIVERWORT	SR ^{SG} AVLAS-----Q-----NSKED	2651
LIGNANO	ASDV-----	2780
COPEPOD	^{SG} TS-----	2507
GLOBOSUM	-----	2474
PALUSTRIS	-----	2534
NEOCALLIMASTIX	-----	2604
GLOMUS	-----	2669
LOBOSPOR	SDS-----	2602
SYNCEPHALASTRUM	ED-----	2581
FUNGIIVORUM	-----	2578
HALBUM	--L-P-----	2697
DPURPUREUM	A--S-----	2702
PVIOLACEUM	^{SG} ISS-----	2700
AMPHIPOD	PSL ^{SG} LVAL-----T-----Q-GGE	2626
SHRIMP	---NSLLSY-----T-----Q-GSD	2595
MUDCRAB	---RSL-----T-----Q-SNE	2589
TARDIGRADE	ASYGSG-S-----	2664
HYDRA	YSR ^{SG} CG-N-----E-----	2534
SALPINGOECA	EGEG-----	2639
SPIDER	SLMSLD-A-----S-----	2603
LIMULUS	SLQTET-S-----S-----	2645
SCORPION	DTSVKN-----	2628
ROTIIFER	-----	2588
CIONA	TSR-----	2634
OCTOPUS	DDI-----	2560
CAPITELLA	P-----	2613
LIMPET	ME-----	2588
SCALLOP	DS-----	2647
LINGULA	S-----	2613
OYSTER	DD-----	2611
SNAIL	VE-----	2611
SPONGE	T-----	2649
PRIAPULA	^{SG} OTV-----	2659
DANTO	AG ^{SG} -----	2631
ESHARK	^{SG} SEG-S-----	2635
BHARK	RS ^{SG} SEA-S-----	2630
XENOPUS	SRAQ-G-T-----	2645
STERLET	YH ^{SG} D-----	2646
GAR	YQSRGG-S-----	2637
HUMAN	TR ^{SG} EG-S-----	2624
PLATYPUS	SR ^{SG} EG-L-----	2628
TASDEVIL	NR ^{SG} EG-S-----	2630
COELACANTH	FR ^{SG} EG-P-----	2636
CAECILIAN	YR ^{SG} EG-S-----	2638
CANARY	NL ^{SG} ER-S-----	2627
OSTRICH	SL ^{SG} QER-S-----	2597
GECKO	HR ^{SG} PGG-S-----	2636
TURTLE	NR ^{SG} EG-S-----	2636
ALLIGATOR	KR ^{SG} EG-S-----	2594
APLYSIA	D-----	2647
TRICHOPLAX	ASFS-----L-----	2611
SOFTCORAL	SSFG-----S-----	2634
STONYCORAL	TP ^{SG} E-----S-----	2662
SEA_ANEMONE	^{SG} -----	2619
SEACUKE	LG ^{SG} SP-P-----	2632
LANCELET	^{SG} SA-----Q-SLS	2661
STARFISH	^{SG} SP-PD-----S-----	2674
SEA_URCHIN	I-RGSP-S ^{SG} -----S-MTS	2663

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Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	---NNP---GNKNPVNKKQ---L---IRA---EV-----	2583
TETRAHYMENA	---MNQLEE---KQIYQDQ---M---KRLVNP---SQO-----	2751
STYLNONCHIA	---SVVEIIS---AQDGNFVRA---V---PVF---SDVSSL-----	2709
APHANOMYCESa	-----LERAGLVKATC---D---RVWSQTC---S-----	2424
APHANOMYCESa	-----IFEGGVKATC---D---PIWSQTC---A-----	2362
PYTHIUM	-----LTEASIQ---SC---G---QOWGS---TCSLD-----	2581
PLASMOPARA	-----SCRNNALSE---DKSLRD---TMQ---SC-----	2554
BREMIA	-----NSSTKYSA---SOPLES---KMQ---SC-----	2537
AEDDES	-----QMERLIKATOFGE---E-G-GLFEP---LDPSIIT-----	2629
MIDGE	-----YYDQMVRA---LGN---D-T-MMFTP---DPMILT-----	2585
BOMBUS	-----T-TSHNSQLMLQATC---D-LDFEPT---YVND---T-----	2506
ANT	-----P-RLIHGGLKLRATC---D-LDFEPT---LDD---N-----	2548
WHIPWORM	-----TALTGLSRLEPPSTSA-W-PLLTP---AEBGVPP-----	2574
TRICHINELLA	-----RKMPYGR---VSTESTA-W-PGFTP---LITDLKK-----	2585
BEEBLE	-----DSKLRQC---T-S-LEFAP---TVVR---S-----	2467
BARNACLE	-----PLPALLRATC---R-S-LAFTP---RORSA---A-----	2499
THRIP	-----DTSYPLLATC---N-S-LIFQP---ADFP---D-----	2531
FLEA	-----FKSNIKIPMIQATC---QE-Q-LQFAP---FDLQ---N-----	2543
WHITEFLY	-----SAQVRA---S-LEFAP---VAVSD---A-----	2596
TICK	-----TSATTPDGPMLRATC---A-E-LQFTP---RGT---S-----	2563
TERMITE	-----TGEHTGAGPLLRATC---A-S-LAFQP---LIEQS---G-----	2608
DAPHNIA	-----FSYGTIQPYLRATC---SSSSAAFS---S---R-----	2416
OSTREOCOCCUS	-----DALK---Q-S-VLLAH---QLDADP---LPAATLSY-----	2587
STENTOR	-----KAK---K-S-SQFAM---PORTSRIR-----HL-----	2342
KLEBSORMIIDIUM	-----GQOPLPGMIRATC---G---PQSLG---LDD---AP-----	2765
CLUBMOSS	-----ALVNHGRGLIRATC---S---YTPSM---L---E-----	2517
MOSS	-----DGATHRRPMMIRATC---T-PSLSQ---VITQGG-----	2646
LIVERWORT	-----DEMTPROAGMIRATC---T---ATLSQ---DITLSSY-----	2680
LIGNANO	-----EPGTLRQLQ---D-G-DGATA---VAMGTDASMLPLRATAVGPMEFAT	2822
COPEPOD	-----SLGMLRATC---A-T-MEFSQ---CAQGNLN-----	2536
GLOBOSUM	-----DEREGGIRATC---E---MVWTP---DQVDAKT-----	2504
PALUSTRIS	-----TOAVGPIRATC---Q---VQWTP---LQW---IGP-----	2566
NEOCALLIMASTIX	-----MYS---K-E-LSFTP---LIEMGTF-----	2631
GLOMUS	-----LKRQEGVLVRATC---E-D-LAFSL---LGGPNAD-----	2704
LOBOSPOR	-----WTLGEDLRATC---S-T-FEFSM---LDGGAPA-----	2637
SYNCEPHALASTRUM	-----L---ELQLRR---Q-E-LAFSK---LDGYSGD-----	2613
FUNCTIVORUM	-----FPFPRVTL---A---PEFRVATVLDDE-----	2606
HALBUM	-----TPDGDNFGRPRATC---L---PMFSL---SSFS-----	2724
DPURPUREUM	-----SNQMDIDEIRATC---A---PQFTL---DPTAFS-----	2729
PVIOLACEUM	-----SMMMDQDEIRATC---T---PQFTL---DPTAFR-----	2727
AMPHIPOD	-----VGHT---LAALAA---Q---RQFTP---CAAA---PE-----	2658
SHRIMP	-----TNMETDGPAGVQATC---A---NVFSATC-----	2626
MUDCRAB	-----AEDDVGPRGVAATC---A---NVFSATC-----	2620
TARDIGRADE	-----G-SRN-G---A-A-PIFTP---CALAGP-----	2683
HYDRA	-----EVVPTKLVQVVRATC---K-K-LDFSQ---LHQ-----	2566
SALPINGOECA	-----EDEDPSGVRATC---A-S-LAFTP---MASLT-G-----	2673
SPIDER	-----DLTSFRHDLKLRATC---V-N-IDFPE---LDVNDVD-----	2641
LIMULUS	-----NTHGTSGGQHLRATC---A-N-LQFTA---LDD---PG-----	2680
SCORPION	-----IDEQIRSNV---D-V-REFDP---L---DQ-----	2656
ROTIFFER	-----VLRHNLRA---Q-T-LQFPL---K-----	2613
CIONA	-----KQNPRIILATC---Q-D-LQFTA---LVE-----	2663
OCTOPUS	-----KTENMGADELRATC---G-N-QQFTP---LDD-----	2589
CAPITELLA	-----DAGLSTGQLRATC---D-A-AQFTQ---CAD---G-----	2646
LIMPET	-----GVEDSLDGGVRATC---D-V---QFTAT---CDA---G-----	2620
SCALLOP	-----PPSDSLDGGIQATA---D-V-QQFTA---CDD---G-----	2679
LINGULA	-----GSFDDSPVGVRA---E-I-QQFTP---CG---A-----	2645
OYSTER	-----ESYSGEIRATC---D-A-QQFTA---LDD---A-----	2640
SNAIL	-----DSLRRGVRA---D-V-EQFTA---LDET---G-----	2641
SPONGE	-----GSIQTGLRATC---QQS-LAFTP---CG-----	2679
PRIAPULA	-----AAAMQTEIRATC---V-V-PEFTA---LDDV---A-----	2692
DANTO	-----AATVRGQIRATC---T-S-LEFSQ---LAPG---A-----	2664
ESHARK	-----LTPAQITIGLVRATC---T-H-YEFTP---LRI---P-----	2668
BHARK	-----TYDQNTIGGIRATC---T-H-YEFTP---LRI---S-----	2663
XENOPUS	-----IEADEPIGGQLRATC---Q-H-YQFTP---LRI---I-----	2679
STERLET	-----SPQGTIGGVRATC---A-Q-LEFTQ---LCA---A-----	2679
GAR	-----ASAQSLGGQLRATC---S-T-LEFTQ---LDD---P-----	2671
HUMAN	-----LSARWPVAGVIRATC---Q-Q-HDFTL---LCT---A-----	2658
PLATYPUS	-----LPGQGLLLGQLRATC---Q-YEFTP---LRI---T-----	2661
TASDEVIL	-----LSLPRLLTKQIRATC---Q-Q-YEFTP---LRI---I-----	2664
COELACANTH	-----EQVQSLGGQVRATC---V-Q-FDFTP---LRI---T-----	2670
CAECILIAN	-----FPAQSSLLGGQVRATC---Q-Q-YEFTP---LRI---I-----	2672
CANARY	-----LSPSGSVRQVRA---R-Q-YEFTP---LRI---G-----	2661
OSTRICH	-----PSTSGSGGRVRA---Q-Q-YEFTP---LRI---I-----	2631
GECKO	-----LTHGSMGGQLRATC---Q-Q-YEFTP---LRI---I-----	2670
TURTLE	-----LSTQSLGGQVRATC---Q-Q-YEFTP---LRI---V-----	2670
ALLIGATOR	-----LSTPGSQAGVRA---Q-Q-YEFTP---LRI---M-----	2628
APLYSIA	-----ESDQLDGLRATC---D-V-QQFTA---LDDAT-----	2680
TRICHOPLAX	-----SGSSSTDEHLLRATC---STN-LQFTP---LDDT-----	2643
SOFTCORAL	-----HSMIDTDGGQLRATC---N-PQFSMT---TAGATG-----	2671
STONYCORAL	-----MSVDGSPGLRATC---N-LQFTP---LDD---Q-----	2693
SEA_ANEMONE	-----G-GSLEPGALRATC---L-R-VEFSP---LMD---Q-----	2651
SEACUCU	-----ETLGGQVRATC---D-G-QQFTA---LDDAARA-----	2666
LANCELET	-----QGGQDTLGGQLRATC---D-V-LQFTA---LDD---ASA-----	2696
STARFISH	-----SLSRGEIRATC---D-A-HQFTA---LDDAVALA-----	2708
SEA_URCHIN	-----SGMSMGGGQLRATC---A-T-QNFTA---LDDAAS-----	2700

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Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM				2583
TETRAHYMENA	-S	-NRNP	-YTFNQSQLFPDNKMSISEENE	2778
STYLONCCHIA	-N	-NRSSP	-PITDGISASFYEINKFNKRPNQG	2739
APHANOMYCEsa			-QQFOSSQGAATGGS	2442
APHANOMYCEse			-QHFTQSQVESSAPN	2380
PYTHIUM			-GSAS-SSQLISSSQAFSGSSS	2601
PLASMOPARA			-LIFSPOASVRLKS	2572
BREMIA			-LYSNALTSRGSRL	2555
AEDES	-SF		-TLP-TQHSLMFEINPPILD	2649
MIDGE	-SF		-NFQQTQNSLFFNLKPOYLD	2606
BOMBUS	-I			2507
ANT	-TT			2550
WHIPWORM	-ETF	-GS	-AMD-ES	2584
TRICHINELLA	-DTF	-EL	-DLD-ES	2595
BEEBLE			-TMS--ESSLPFK	2477
BARNACLE	-L		-TQTAAAP--AGT	2510
THRIP	-A	-TKLKSS	-LSR--SSFLFSQDTSQSSKTALRG	2560
FLEA			-SH-	2545
WHITEFLY	-PQVTSLLNDS		-GVP--SSFDVNTSKFKS--RSF	2625
TICK	-G	-SF	-NW--LTQSTLES--NLS	2579
TERMITE	-P	-SF	-SLS--SLLFTTGSFEN--QRK	2630
DAPHNIA	-LMAE-TLSTEPSS		-KPV--TSKAAM	2434
OSTREOCOCCLUS			-KRL	2593
STENTOR				2342
KLEBSORMIDIUM			-SQGDFVSS--SLMATQSGGFRGGFSQVGLT	2793
CLUMBOSS			-GSD--EP	2522
MOSS	-S	-S	-TQGVNGSVLYLSQ--RP	2664
LIVERWORT			-PLASQESSLPAMSR--KS	2696
LIGNANO	QLHPSAAT	-AGLLADSQ	-DLSVSTSLFRSSGGGGGAG--LEV	2862
COPEPOD	-PNLS		-SNGTPMS	2547
GLOBOSUM	-SRLQ-S		-EFDSQ--TQS	2517
PALUSTRIS	-SGSE-S		-EPTSA--PTS	2579
NEOCALLIMASTIX	-SQST-LI		-VNFEINLNININTIKSSNKNSISL-	2660
GLOMUS	-SLTQ-S		-NLLFSQSFIPSLPRS	2724
LOBOSPOR	-ANPS-S		-TLMFRNT-PVQGA	2655
SYNCEPHALASTRUM	-PTPE-SL		-SNVLLPTSSAAQASQOAT	2637
FUNCTIVORUM	-TPGS-LSSLFGAS	-MSKQ	-RPA--VS	2627
HALBUM	-YPSG-SSSSYSEL	-SSSQEQ	-SSSATTSTTFSVGSAPPDSQS	2763
DPURPUREUM	-YPSS-SQESSNAS	-SQQS	-SQ--SS	2749
PVIOLACEUM	-YPSS-NSQSVDS	-VTMSVS	-SSSSQGSQ--RS	2755
AMPHIPOD	-GTDA-SMQEVS	-FTQLQDKAN	-TVSQGSAGLVFSLKT--NQAR	2697
SHRIMP	-VTDS-TFDTTLA	-DMEYEATHA	-PTQGSGLIFNVGASGQKDRR	2668
MUDCRAB	-VTES-TFDTSLA	-DMEYAATHA	-PIHGSASGPMFNVGAHGKNNM	2662
TARDIGRADE	-ANDTLAVAGF	-TYS	-SQFAESLLIDLRRGLITR	2715
HYDRA	-MSPTIQTPO-E	-MLPG	-LNIQTNSKNRK	2592
SALPINGOECA	-EPGGISGQTLTHT	-QY	-TAAQVLLFERRNRGANV	2707
SPIDER	-LTER-SLDTFAPQMSSGDSGYSSF		-TNSPVKTHLFALKKNK	2681
LIMULUS	-LTQS-SIDTMEQWGSLEAMDAS		-MGSSGSLFFTIGRKTAPAS	2722
SCORPION	-LTQT-SIDTLGDWGS		-TSSSLLFTIGSDTKKIPN	2690
ROTIIFER	-LTQS-SIDTPTT	-NL	-IDTKSLLFKTES	2640
CLIONA	-MTGS-SLDTFSSL	-AV	-GDHQKSSLLASSITSPASYRRLGRKL	2703
OCTOPIUS	-LTQS-SLSSSMEV	-DSV	-DSGIQSSLLTVSGKATAVSQ	2624
CAPITTELLA	-LTQS-SLDTF-S	-DSQNLTL	-ATQSESSLMTFVGSRRKSSK	2684
LIMPET	-LTQS-SLDTY-G	-DYGSMS	-SSETPSSLLFVSGTSGSQSTNKR	2659
SCALLOP	-LTQS-SLDTF-T	-DYGTVG	-SEPQSALLFTVGSMEASARIGRP	2718
LINGULA	-LTQS-SLDTF-A	-EYSTQS	-METQSSLLFVNGTANENQTPKKK	2684
OYSTER	-LTQS-SLDTF-T	-DYSTVG	-SETSSSLLFTVGTQDMALRTGLK	2679
SNAIL	-LTQS-SLDTF-A	-DASLME	-TNSLSSLLFTVGSSSKADSKTRVATR	2684
SPONGE	-MTPSAQSV		-DYSVPSFTVGATPTSDSSLLFTRPTMRPLK	2718
PRIAPULA	-LTQSSSIDTFADQ	-SLSSVSS	-ISSSS-SSSPYS-SPSADHHE	2731
DANTIO	-LTGS-SVDTL-A	-DYSLSS	-DSLSSLLVFDKRRSERPO	2701
ESHARK	-LTGN-SLDTF-A	-EYSLPSL	-ASEPSSSLLVFSRWBELR	2709
BSHARK	-LTGS-SLDTF-A	-EYTLFPS	-ESASSSLLVFSKRSEKSRQ	2701
XENOPUS	-LTGS-SMDTL-A	-DYSVES	-PESLPSALLPVNKRNRNVR	2718
STERLET	-LTGG-SIDTL-S	-EYSLPSS	-ADSVSSSLLVFGKRGKDSQ	2719
GAR	-LTGS-SVDTL-S	-EYALPAT	-SDLSLSSLLVFGKWKQKQQQ-QQRGPK	2715
HUMAN	-LTGS-SVDPL-V	-DHTSPSS	-DSLLFAHKRSERLQR	2693
PLATYPUS	-LTGS-SVDTF-T	-DYPGPTS	-SESLS-TLLFTHKRSRTQK	2700
TASDEVIL	-LTGS-SIDTL-A	-DYTIPSL	-SESLSSSLLVFKHRTDKPQR	2704
COELACANTH	-LTGS-SVDTF-A	-EYSLPSS	-SESLASSLLAYGKRSEKSRQ	2710
CAECILIAN	-LTGN-SIDTL-A	-EYGVPS	-SESLSSSLLVFSKRSKSR	2712
CANARY	-LTGS-SIDTL-A	-EYAVPSS	-SESLSSSMLLVSKRSEKFKQ	2701
OSTRICH	-LTGN-SIDTL-A	-EYVPSF	-SESLSSSMLLVSKRSEKFKQ	2671
GECKO	-LTGN-SVDTF-A	-EYVTS	-SESLSSSMLLVTHKHAQSR	2710
TURTLE	-LTGS-SIDTL-A	-EYVPS	-SESLSSSMLLVFSKRSKSR	2710
ALLIGATOR	-LTGS-SIDTL-T	-EYTVPS	-SESLSSSMLLVNKRSEKSRQ	2668
APLYSIA	-LTQS-SLDTFTDT	-AVI	-GGDQLLFRDRRQGGQSAKGSLLK	2722
TRICHOPLAX	-LDPS-SVDKSIQSYAFLQQLSST		-SSETSTLLFLSKSPRO	2690
SOFTCORAL	-LNPS-SLDTSS	-SASFVS	-G-SQPSSLLFKSNPNMRRFK	2710
STONYCORAL	-LNPT-QESNLQPS	-QSFAMA	-STQTQSLFFSTQSHKR	2733
SEA ANEMONE	-LNPS-SQADS-V	-QSFVVG	-SSEAQSSLLFGTKP--RA--SQRSL	2688
SEACUCIE	-LTG-SQDTE-A	-SYSASL	-GTESSSSLLFTIGTKQKAVLGAKIKV	2709
LANCELET	-LTQS-SLDTF-A	-DYSVPL	-GTETQSSLLFTDASKKAVARR	2736
STARFISH	-LTG-SQDTE-A	-DYSTSS	-A-SDQSSLLFTLGASKPKM-GRGROGVSK	2749
SEA_URCHIN	-LTG-SQDTE-A	-DYSSSS	-S-ASESSSLLFTMGSLPKRTAQGFRGVK	2741

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----IQOS-----Q--YFDEEGFRIPM--KS	2601
TETRAHYMENA	-----DDNEEG--E--FKKIDLFGDTIQEK	2801
STYLONCCHIA	-----QVVNLRIGAQSSQDK--V--ADDDGFIAIPVAKRK	2770
APHANOMYCEsa	-----I-----QTT--SAGLAPRT	2454
APHANOMYCEse	-----S-----SSH--RRDI--T	2389
PYTHIUM	-----S-QF--A-----ASSQFDGSPQKGRK	2620
PLASMOPARA	-----SYRQS--I-----VDPFTD--LRO	2587
BREMIA	-----SYSQS--S-----GRTNVA--PGO	2570
AEDDES	RRSRRTTPQIM-----R--TPTTRSAQSYDSLK	2673
MIDGE	MRSSFTPNSAADDDEIEA-----RIARKKPKRHDFAFDYLR	2643
BOMBUS	-----NLGE--DNTFFV-----PKVPOPAYNKLK	2529
ANT	-----FNILSYVIGF--DRTTQS-----TSRSLQVAPKRSF	2582
WHIPWORM	-----SGVLEMDAAL--EKH--IAGRRLLPQHRAIP--SSICDF--KLLK	2623
TRICHOINELLA	-----DSSNLTIVIL--DKI--LQD--IKKPKSSRVKXVDD--LGLQLOFLK	2634
BEEBLE	-----P--E--EKS--FV-----DPSINLSYKYRIPK	2500
BARNACLE	GTPSGARLRVYTD-----V--DG--GCGAGADA--LSRML	2540
THRIP	SFKOGANFGSLLQLSE-----V--PT--EHEKSPKRTK	2589
FLEA	-----D--TLNLYMFDADN--EEI--KVE--DLGSQQLKDSFLKLR	2578
WHITEFLY	MRKFKPQSTDIAN-----VG--HVISSQH--KSY--RLK	2655
TICK	GARRRSLSILSPAPVO--EIV--LLG--ASQTSQSKSLGFLR	2617
TERMITE	SYKMGPGFGSSKLPQIP--E--VS--D--D--VDSRS--DRLAPNLH	2665
DAPHNIA	-----KKT--T-----D--V--E--K--E--TF--K--S--P--L--K--S--W	2453
OSTREOCOCCLUS	PKSAYAKDVS-----S--T--L--H--T--S--F--S--A--V--I	2616
STENTOR	-----QGVQQLG--G-----R--G--S--Q--S--I--D--R--R	2354
KLEBSORIDIUM	-----GQTONAA--D-----G--S--O--N--V--A--V--D--P--V--T--K--N	2545
CLUBMOSS	-----GGAGY--KK--T-----G--L--E--A--S--M--D--P--A--L--H--L--R	2688
LIVERWORT	-----S--V--T--H--T--Q--V--T-----S--O--T--G--S--T--D--S--L--P--G--L--R	2719
LIGNANO	SAAGLAGYH--TALG--SDA-----N--P--M--A--G--Q--A--Q--L--H--R--L--R	2894
COPEPOD	ARPGPGYRRS-----T--T--P--M--V--G--S--L--V--A--G	2569
GLOBOSUM	-----S--T--Q-----P--F--I--D--R--R--T--L--V--R--R--	2531
PALUSTRIS	-----T--Q--F--E--G-----P--O--A--D--R--A--F--T--S--Y--T--R--R--	2598
NEOCALLIMASTIX	-----N--D--N--D--K--T--I--S--N-----S--O--K--D--N--R--L--L--V--P--O--R--R--R	2686
GLOMUS	-----D--Q--G--T-----Q--K--S--V--R--S--S--E--Y--O--R--F--G	2742
LOBOSPOR	-----P--K--L--S--I--E--A-----S--I--L--L--D--S--Q--K--Y--R--R--L--Q	2675
SYNCEPHALASTRUM	DSFRS--VGR-----T--E--K--T--R--R--A--Y--D--R--I--G	2659
FUNCTIVORUM	-----R--K--D--K--T--E--A--S--P--F-----I--P--S--O--V--F--P--S--L--E--K--S--R	2654
HALBUM	-----G--K--A--N--K--P--V--A--N--K--P--D--K--A--G--T--F--K--V--P--A--N--I--D--P--R--V--E--M--R	2797
DPURPUREUM	-----R--S--N--S--Q--Q--O-----R--V--L--Y--R--N--P--K--S--F--E--N--N--E--L--R	2773
PVIOLACEUM	-----N--S--N--G--K--K--Q--L--N-----V--V--A--S--C--D--L--R--S--N--T--Y--N--Q--L--R	2781
AMPHIPOD	-----T--Y--S--K--T--G--L--K--T--R--L--K--P--K--T--F--G--D--E--N-----D--G--D--E--T--P--S--A--I--V--S--L--V--R	2733
SHRIMP	RFKRPFGIGNSRMRPADDP-----D--G--N--D--A--D--T--M--Q--S--K--L--I--R	2701
MUDCRAB	RYKKSIGNTCMQPAETS-----T--T--T--D--S--G--N--I--Q--S--K--L--L--R	2694
TARDIGRADE	-----D--E--H-----T--T--E--I--S--R--L--D--K--E--M--D--T--V--K	2733
HYDRA	-----S--V--T--P--S--L--A--T--P--O-----R--A--E--R--Q--A--R--E--I--O--R--L--R	2606
SALPINGOECA	-----S--V--T--P--S--L--A--T--P--O-----R--A--E--R--Q--A--R--E--I--O--R--L--R	2734
SPIDER	-----S--T--K--T--K--F--Q--I--D--L--E--D--N-----E--K--N--E--K--K--S--T--T--W--M--L--K	2708
LIMULUS	SPPTKGGRSLKAV--SDIV--DS-----T--S--S--S--S--V--S--D--L--L--R--L--K	2755
SCORPION	-----I--D--N--N--R--N--S--N-----Q--U--T--S--K--N-----K--I--E--L--L--S--S--N--T--P--H--L--R	2719
ROTIFFER	-----I--D--N--N--R--N--S--N-----Q--U--T--S--K--N-----K--I--E--L--L--S--S--N--T--P--H--L--R	2654
CIONA	-----V--D--P--G--P--E--F--K--V--D--L--V--K--O--C--K--K-----K--Q--R--G--F--G--V--A--I--D--V--O--R--L--R	2740
OCTOPUS	VYPTKRPGPGFGOKLSALKDSOE--DP--L--E--S--O--K--I--N--K--S--K--F--A--Y--L--K	2670
CAPITELLA	-----K--T--P--G--E--F--G--O--R--K--V--K--S--D--V--R-----V--S--A--M--D--B--A--N--K--I--M--L--K	2716
LIMPET	-----Q--S--K--A--G--L--R--R--O--T--I--V--K--O--L--G--H--A--P--K-----S--G--M--L--N--K--S--D--T--W--K--L--R	2696
SCALLOP	RMRPKPSGFGQPPGPPSPKVKTE--E--KA--G--P--S--E--D--E--G--N--E--M--F--R--L--K	2758
LINGULA	RYKKTGPFKGRKLMGDTFT--DS--R--E--D--D--S--E--K--E--I--Q--N--L--K	2722
OYSTER	PKRRPGPGFGRPR--AGAS--SK--PAE--R--S--R--N--E--D--O--S--E--M--Y--R--L--K	2716
SNAIL	HHHTGTGNSFKQMA--T--E--R--T--G--N--S--A--G--P--K--N--D--N--T--P--E--D--N--W--K--L--R	2726
SPONGE	-----N--P--L--R--I--S--A--R--L--G--K--V--G--E--S--G-----G--E--K--E--K--K--O--V--L--Q--L--K	2751
PRIAPULA	-----T--P--T--A--K--R--R--G--A--T--G--E--E--P--R--E-----E--S--A--A--G--G--D--V--M--R--L--R	2763
DANTO	RAVGAGFGSKRLTATS--DUT--DS--R--T--A--A--E--R--E--R--A--D--I--L--R--L--R	2738
ESHARK	-----K--P--V--G--P--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--G--I--D--O--R--A--D--I--L--R--L--R	2746
BSHARK	-----K--P--V--G--P--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--G--I--D--O--R--A--D--I--L--R--L--R	2738
XENOPUS	-----K--P--L--G--P--N--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--G--I--D--O--R--A--D--I--L--R--L--R	2754
STERLET	-----K--P--V--G--P--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--G--I--D--O--R--A--D--I--L--R--L--R	2755
GAR	-----K--P--V--G--A--D--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--G--I--D--O--R--A--D--I--L--R--L--R	2752
HUMAN	-----K--S--V--G--P--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--G--I--D--O--R--A--D--I--L--R--L--R	2729
PLATYPUS	-----K--P--L--G--P--N--F--G--K--R--V--L--P--G--D--E--V--D--S--K-----T--R--G--I--E--R--T--E--I--L--R--L--R	2736
TASDEVIL	-----K--S--V--G--P--N--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--G--I--D--E--R--A--B--I--L--R--L--R	2740
COELACANTH	-----K--P--V--G--P--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----T--R--V--A--D--O--R--L--D--I--L--R--L--R	2746
CAECILIAN	-----K--P--L--G--P--N--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----K--A--R--G--I--D--D--R--S--D--I--L--R--L--R	2748
CANARY	-----K--P--V--G--P--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----K--T--R--G--I--E--R--A--B--I--L--R--L--R	2737
OSTRICH	-----K--P--V--G--P--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----K--I--R--G--I--D--E--R--A--B--I--L--R--L--R	2707
GECKO	-----K--P--L--G--P--N--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----K--T--R--G--I--D--E--R--A--B--I--L--R--L--R	2746
TURTLE	-----K--P--L--G--P--N--F--G--K--R--L--A--L--P--G--D--E--V--D--S--K-----K--A--R--G--I--D--E--R--A--B--I--L--R--L--R	2746
ALLIGATOR	-----K--P--V--G--P--N--F--G--K--K--L--A--L--P--G--D--E--V--D--S--T--T--D--I--N--E--R--A--B--I--L--R--L--R	2704
APLYSIA	GPSPGEEKMAAVRTPAGGAGPGDAAAVTGNO--D--V--A--D--G--A--G--S--O--T--I--W--R--L--K	2772
TRICHOPLAX	-----K--P--L--S--D--F--G--O--Q--L--S--E--T--A--S--O--P--O--S--Q-----S--V--S--Q--P--S--S--L--N--H--L--R	2726
SOFTCORAL	-----R--P--O--S--E--O--P-----S--T--S--A--A--O--S--D--D--P-----S--N--E--S--S--O--L--O--N--I--R--K--L--K	2743
STONYCORAL	-----K--P--V--P--G--D--F--G--S--Q--L--S--Q--A--S--S--R--I--S--S-----H--O--S--O--P--N--E--K--K--E--I--L--K--L--K	2771
SEA ANEMONE	-----K--P--V--P--H--F--G--S--R--L--A--P--T--Q--S--D--S--Q-----Q-----T--P--A--M--G--S--O--O--O--I--L--R--L--K	2725
SEA CUCUR	-----K--P--V--G--P--G--F--G--K--R--L--S--V--Q--K--O--N--T--D--T-----G--A--S--K--A--E--G--K--E--I--M--R--L--K	2745
LANCELET	-----K--P--V--G--P--G--F--G--S--D--R--L--S--A--G--R--D--Q--T--D--G-----R--A--A--E--D--S--O--O--S--E--I--M--R--L--K	2772
STARFISH	-----T--A--T--D--A--G--F--G--K--E--L--Q--S--D--O--P--R--G--R--D--E--V-----D--A--Q--O--S--G--E--D--K--I--N--R--L--K	2787
SEA URCHIN	-----O--A--G--A--G--G--S--R--D--K--E--V--A-----R--K--A--P--S--E--E--K--K--V--O--R--L--K	2769

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	NKSHLSQFLQANFTIS	-----FQQIQL-TSNNOIRYKPE	SATSLSLDPTEKYY-KLKSQ	2651
TETRAHYMENA	KNNLSKPFASHLFD	-----FSQVNK-NSTNKIRYODSKE	GKLTLN-----TVDIK	2846
STYLNCHIA	CKADLAKFPAQNYV	-----YRPOESQOGQRIRYVPGSMPALOK	-----OEIR	2817
APHANOMYCESa	V---	RFTYS-----TSNARISD	-----ESSRTKTFPOEASRS	2484
APHANOMYCESa	A---	KRFTK-----HRGNEPGN	-----QENRTKSYFQDOASRS	2419
PYTHIUM	R---	RFTVKQST-----VFS--SGEARG	-----AKGADKRYFOERYALF	2654
PLASMOPARA	N---	RFTTRNF-----ADSSAVEDKXSN	-----DKLKLKRFYQDKYAML	2624
BREMIA	V---	RFLKORAA-----VDH--TTDKVPSN	-----KDKVSKLYPODOHGFL	2606
AEDES	K---	RILKOKD-----	-----RSARDQALKAI DR	2694
MIDGE	H---	RILKQHE-----	-----NRSKDYAMKAI DR	2665
BOMBUS	K---	RFLSNAS-----	-----DISAATROKBI KR	2550
ANT	T---	RILAMTS-----	-----DVAITYRBOIRK	2603
WHIPWORM	R---	RILKDTF-----	-----QKQFYANLAKKK	2643
TRICHINELLA	N---	RILKDTF-----	-----E-KAFVNLNKRK	2654
BEEBLE	R---	RFLKDKA-----	-----KVHSYPAQOQVKK	2521
BARNACLE	R---	RRVETDAR-----	-----QVSARMARRHADO	2562
THRIP	R---	ARFYGRS-----	-----KAVSVFSKANVKK	2611
FLEA	R---	RDLKDXD-----	-----KASQOFAARAI AK	2599
WHITEFLY	K---	TGSKEDDS-----	-----KYALQNIKL---	2673
TICK	R---	RFLRDED-----	-----KVKLQHIKREVRK	2638
TERMITE	R---	RFLRRDD-----	-----QKRIFHASREIQR	2686
DAPHNIA	K---	RFTTGP-----	-----PPA-----	2464
OSTREOCOCCUS	P---	RFLDQGV-----	-----Q-----	2626
STENTOR	E---	KLKA-----	-----	2360
KLEBSORIDIUM	R---	RILKRF-----	-----T-SQVLQGLGA	2835
CLUBMOSS	R---	RLYVYKES-----	-----R-AGTLRNVFNA	2565
MOSS	R---	RILNPRAT-----	-----Q-SQVLTVGFPA	2708
LIVERWORT	R---	RILANAA-----	-----R-SQVIRSVLNA	2739
LIGNANO	R---	RMLFLOQQQQQAASSSSGAAASSSDGPPATQ	-----GSSSSYSAPAQAGVER	2943
COPEPOD	R---	RFLKQK-----	-----AGYKSTFSKIAERO	2593
GLOBOSUM	---	SYA--SK-----	-----YDSTYFAYGAERK	2549
PALUSTRIS	---	QVQ--GT-----	-----YDHRFYAAQOERO	2616
NEOCALLIMASTIX	A---	LRVYKTSN-----	-----ARKIFPANAALIK	2708
GLOMUS	R---	RSFKPSQ-----	-----L--DFKQMMATO	2761
LOBOSPOR	M---	RHVHATV-----	-----SOSQYRRAYEAK	2697
SYMCEPHALASTRUM	K---	RFLKTSR-----	-----DSTYFPRRHEERO	2681
FUNGIIVORUM	K---	RFLKQTP-----	-----NRS-----QOMETR	2673
HALBUM	N---	RKKKDNK-----	-----DCEHNAAPARLAVKK	2822
DPURPUREUM	K---	RFKIDDK-----	-----GSDRHWKPARMQVKK	2798
PVIOLACEUM	K---	RFKKVDK-----	-----VQCGRIAGPARLQVMR	2806
AMPHIPOD	R---	RFLROOD-----	-----KQOYRFPAQAEKR	2756
SHRIMP	R---	RFLKQND-----	-----REKQSIYFAKIEERR	2724
MUDCRAB	K---	RFLKQDD-----	-----REKQTIFFAKOBERR	2717
TARDIGRADE	R---	RFLRDSNS-----	-----DSSNKSFFIKREYGR	2757
HYDRA	F---	RHFKNKS-----	-----EHSYYPASLEKKR	2627
SALPINGOEA	R---	RFLVKSOK-----	-----RAQAALFHAKRMAAR	2758
SPIDER	K---	RFLKOKA-----	-----NSE-VFAROLRR	2728
LIMULUS	R---	RFLKQDE-----	-----KHLRVFVKRAARL	2776
SCORPION	R---	RFLKQRE-----	-----KSLRHFIRBHRK	2740
ROTIIFER	R---	RFLKQAE-----	-----SOSKFFARKQIAK	2676
CIONA	R---	RFLKQOT-----	-----DSRINPARVQEVK	2761
OCTOPUS	K---	RVLKQRE-----	-----AQSLYPAKKQITK	2691
CAPITELLA	R---	RFLHDOE-----	-----STARFFMKKNVRM	2737
LIMPET	R---	RFLKQKD-----	-----DRLFFMKKNVRL	2716
SCALLOP	R---	RFLRDEE-----	-----ASRIFPARTRVRV	2779
LINGULA	R---	RFLKQOR-----	-----ARSTYFAKKNI RL	2743
OYSTER	R---	RFLRDEE-----	-----QTKTYPIKRHTRL	2737
SNAIL	R---	RFLKORS-----	-----TASKYFARRI KE	2747
SPONGE	K---	RALKQKE-----	-----MVSSFFAMNEARK	2772
PRIAPULA	R---	RFLKQDE-----	-----QTVVFARRHARR	2784
DANTO	R---	RFLKQDE-----	-----KESIFPAKKEIHS	2759
ESHARK	R---	RFLKQRE-----	-----KVSILYARKGVAE	2767
BHARK	R---	RFLKQRO-----	-----KSLNIPARKSIOE	2759
XENOPUS	R---	RFLKQRE-----	-----KLSLIYARKGTAE	2775
STERLET	R---	RFLKQDE-----	-----KVSILYARKGVRE	2776
GAR	R---	RFLKQDE-----	-----KVSLOFARKGIOA	2773
HUMAN	R---	RFLRQDE-----	-----KLSLMYARKGVAE	2750
PLATYPUS	R---	RFLKQDE-----	-----KLSLIFAKKGVVE	2757
TASDEVIL	R---	RFLKQDE-----	-----KLSLIYARKGVVE	2761
COELACANTH	R---	RFLKQDE-----	-----KVSILYARKGVQI	2767
CAECILIAN	R---	RFLKQOG-----	-----QISKIFVRRGVAE	2769
CANARY	R---	RFLKQOD-----	-----KLSLIYARKSLAE	2758
OSTRICH	R---	RFLKQDE-----	-----KLSLIYARKGVAE	2728
GECKO	R---	RFLKQDE-----	-----KLSLIYARKGVAE	2767
TURTLE	R---	RFLKQDE-----	-----KLSLIYARKGVAE	2767
ALLIGATOR	R---	RFLKQDE-----	-----KLSVIYARKGVAE	2725
APLYSIA	R---	RFLKQKD-----	-----AQSVHFMRRNI RL	2793
TRICHOPLAX	R---	RVLKSEM-----	-----ANNAFYAKKERRK	2747
SOFTCORAL	R---	RFLKQDK-----	-----ETDVIYFAKKEIAR	2764
STONYCORAL	R---	RFLKQDS-----	-----QISAFFAKQALKR	2792
SEA_ANEMONE	R---	RFTKDSQT-----	-----KDRQYFIRMEKKK	2747
SEACUKE	R---	RFLKQOK-----	-----SSSLYPAKREKKK	2767
LANCELET	R---	RFLKQDD-----	-----VTKAYHARROIRM	2793
STARFISH	R---	RFLKQHS-----	-----SQAYFARREMKR	2808
SEA_URCHIN	R---	RFLKQOS-----	-----SQSAFFAKRATRO	2790

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	QPSSQMYTST--QGFELKPVQNRVRRKRELDLPIKIKHKDIDPLIVLQPEFDELGRV	2709
TETRAHYMENA	KRQOQLFFEN--QNRMRKQOQLTRKXIKHSLPDIGLVKDIIDPMALSPIDEIAGQL	2904
STYLONCHEA	KMORBOYLOR--QIQOKKHOVGLRRRVVGLPDIOISYEDVLPKQALIKSDLTITEV	2875
APHANOMYCESa	KROELARLNQ--KBAKGTAVSLRAIVRVEFPDIQIPRMDVLRPLLVASLHAAISAL	2541
APHANOMYCESa	KKLEIARIKQ--AKSKGSKVSLRAIVRVEFPDIQIPRMDVLRPLLVASLHAAISAL	2476
PYTHIUM	KKTEBALLNR--QKARDQOVQMRKRVVGEFPDIQIKLKDIDPLMALCEMDDAISAI	2712
PLASMOPARA	KKHDLAKMTR--ER--HOEHVRIKRAVRAGEFPDIQITQDDIVDPIMALCEVVEISLL	2680
BREMIA	KKREBAQIR--ERNROGHVMMKRSRVGEFPDIQITQDDIVDPIMALCEVVEISGLV	2664
AEDDES	YTYETVRRKASH--KMRQGEVVLRRVRIQDFPDLINSLALMLPQALCRPPPLARQV	2752
MIDGE	RNFQARSRRKRFOSRCKEYKLRVRLGELPDPFFNTLAVLLPQLAKRIDQDIPRDV	2725
BOMBUS	NIQBARMIKD--RGVROSSVKLRKRVRIQDFPDIETSHATLEPQLQAKNDLHKKDL	2608
ANT	NBQRTIRIKQ--EVAROSSVKLRKRVRIQDFPDIETSHATLEPQLQAKNDLHKKDL	2661
WHIPWORM	QOMLQWATF--AAQTKSYVRLKRSRRRDFPDIQIPHAAIVTTLQAVQLGDTSGLL	2701
TRICHOINELLA	QKVIETRLKO-----QSLDRKRRRDFPDIQIPYSVAIITLQAVBELRVFGAL	2705
BEEFLE	SSKTIKXKKE--PAKREKNTIYRSYKGDLPDQVITLQAVLEPQLIALLRREIKSL	2579
BARNACLE	RALFEDQRD--EPRQDAQVLFRRVRRGELPDIETPYSDLLRPLQALMHPPIARL	2620
THRIP	AKRREEMWRE--RKLREGEQVAMHRKVRIGDLPDIQIKFADVINPLTELARHDSIIRKTI	2669
FLEA	KKKDRRLIT--RSKMKTSKVTMYRQVRIQDFPDIQITNAAILLPKELAKRSSIQIV	2657
WHITEFLY	NKALBIAQRE--EVEKRSKVTIYRVTGDFPDIETSYKELVPLRVFVQDQSRHLL	2731
TICK	KELRGEQRE--RRARREAVTLRSYRIGDLPDIETPHSALVAPLQALQHQDQVQVL	2696
TERMITE	SARQOELQO--RGRRLANIASFREYRSDFPDIETSYSAITKPMQELAKRDAAVRHL	2744
DAPHNIA	--KPSYENRGR--SANKTSSQPTIYRKYRTGELPDIQIPPSLILAPLCAVRNDAILIKTL	2521
OSTREOCOCCLUS	RTLGQSVLLD---IDGLKODIKLRSYRTGELPDIKISRNELLPFLVYRERSVILKAL	2682
STENTOR	--QGRREBR--TMRKQVNRVRSYRTGELPDIETKRSODIKPLAMILLCEITKSE	2416
KLEBSORIDIUM	RRRRRBAASA--QAGVHKVTMRRSYRTGELPDIQIKFADVINPLTELARHDSIIRKTI	2893
CLUMBOSS	TKKKALQST--EATFRANKVOIMRQVYRTGELPDIETKXHDVIGPMGSLAERDATHRLL	2623
MOSS	SRRRBARLKL--QSLFRANKVHMRQVYRTGELPDIETKXHDVIGPMGSLAERDATHRLL	2766
LIVERWORT	NRRREBARAQ--QASFRANKVHMRQVYRTGELPDIETKXHDVIGPMGSLAERDATHRLL	2797
LIGNANO	HRROARBAE--AAAKREHVVTLRRVYRIGDLPDVOMEQGALVTTLAGLAKORMPGRLL	3001
COPEPOD	NVRKQLEED--QLKASEKNTVLRVYRIGDLPDIQIPYSDLIAPLILKQKLEPELKVVL	2651
GLOBOSUM	KKBARNIETP--QAAASQSVTLRKYRIGDLPDIETKXHDVIGPMGSLAERDATHRLL	2607
PALUSTRIS	KKARAKNOL--QKIARARTVTLARKVYRIGDLPDIETQHSIINPLQALMRDSEVQOV	2674
NEOCALLIMASTIX	KKRIQKHLK--GKQAKLVYTLRKYRIGDLPDIQIKYKELIPLQALAIADTISKNL	2766
GLOMUS	R-KODBIYRT--SQHAFPKNISMLRQVYRIGDLPDIETKXHDVIGPMGSLAERDATHRLL	2818
LOBOSPOR	VONKQAIAAN--KEIARAKSVSIIRKYRIGDLPDIQIAYSVDIPLKSDAEMDVEIKRML	2755
SYNCEPHALASTRUM	RTTLOSLEAM--RRQKREAVTMRKRVYRIGDLPDIQIKNSDLIPLQALGRDNEIKRIL	2739
FUNCTIVORUM	LKWKQOIOA--ARQAKVAVTLRKYRIGDLPDIETKRSODIKPLAMILLCEITKSE	2731
HALBUM	SKDQDLMSK--AKQARENOVTMRKRSYRIGDLPDIQIKLQELIPLQALQDHHVTSV	2880
DUPURPUREUM	NIDREAFFEK--SKQARENOVTMRKRVYRIGDLPDIQIKLQELIPLQALQDHHVTSV	2856
PVIOLACEUM	NKREBSPEK--SKQARENOVTMRKRVYRIGDLPDIQIKLQELIPLQALQDHHVTSV	2864
AMPHIPOD	RALKHRLERE--RTLREAOVTMRKRVYRIGDLPDIQIHRVAVLPLQALSERDSSVHRV	2814
SHRIMP	SKLREKLEKE--RFRREAOVTMRKRVYRIGDLPDIQIHRVAVLPLQALSERDSSVHRV	2782
MUDCRAB	NKMRATLEME--RKLREAOVTMRKRVYRIGDLPDIQIHRVAVLPLQALSERDSSVHRV	2775
TARDIGRADE	RRAIETLKN--ERERSLDVTLRSYRIGDLPDIETSYEAVIPLRNLAEVDQISLL	2815
HYDRA	QKLRSEALEK--RRIARDQVVMRKYRIGDLPDIETKXHDVIGPMGSLAERDATHRLL	2685
SALPINGOECA	KOBARRLLEL--RRKARAQVTLRSYRIGDLPDIQIKRELLIPLQALQDHHVTSV	2816
SPIDER	QDRRKEILKD--QKSHRDAQVTMRKRVYRIGDLPDIETSNASITQPVQALMNDVSIKLL	2786
LIMULUS	KMRRDULLKE--QKSRREAOVTMRKRVYRIGDLPDIETSNASITQPVQALMNDVSIKLL	2834
SCORPION	QQLRREKRE--QKSRREAOVTMRKRVYRIGDLPDIETSNASITQPVQALMNDVSIKLL	2798
ROTIFFER	KVNDLRLKO--LKAARENOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2734
CIONA	KKRETFQKE--HEKRSNDVTLRRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2819
OCTOPOUS	NFTOVOLVHE--QKSHREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2749
CAPITTELA	KKMRDILQRE--QKMKREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2795
LIMPET	RKRREERLME--QKSRRENOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2774
SCALLOP	QOMRQVALQO--QKTRRENOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2837
LINGULA	QAMROBALKE--QKLRREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2801
OYSTER	EKMREALRE--QKSRREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2795
SNAIL	KSKREELRKO--QKLRREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2805
SPONGE	KMRRBELKQO--RRAARENOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2830
PRIAPULA	KORREBAETL--SNQREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2842
DANTO	QRTREBRAD--LKIRODAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2817
ESHARK	QKABQKIKTE--RKMREDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2825
BSHARK	KHLAKEMKTE--QLKRDQAVTLRKYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2817
XENOPOUS	QKREKAKIP--QKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2833
STERLET	QKQKENVAR--QKLRREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2834
GAR	QROKERRAE--QTLRREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2831
HUMAN	QKREKEIKSE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2808
PLATYPUS	QKREKEIKSE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2815
TASDEVIL	QKREKEMNE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2819
COELACANTH	QKEEQMKRE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2825
CABCILIAN	QKREKEITAE--RKMKREAOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2827
CANARY	QKREKEIKSE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2816
OSTRICH	QKREKEMSE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2786
GECKO	LKQKELKTE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2825
TURTLE	QKREKEIKSE--LKMKQDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2825
ALLIGATOR	QKREKIKTE--LTKMKDAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2783
APLYSIA	KOMREBAARE--QKARRENOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2851
TRICHOPLAX	KOLREELIKO--QKIARENKVMRKYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2805
SOFTCORAL	QKLRTEVOR--QKARENKVMRKYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2822
STONYCORAL	NKFRBOALQO--QKAARENOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2805
SEA_ANEMONE	KOMLQOQSR--LKAARENOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2850
SEAUCUE	QOMREELKE--QKREYHOVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2824
LANCELET	QKREERVKE--QKARGNLVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2851
STARFISH	KOLKELIKTE--QKREKFTVTRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2866
SEA_URCHIN	KELREEVOKS--QKRRPAQVTMRKRVYRIGDLPDIQIKHSYIAPLQALQDHHVTSV	2846

(YR)xYRxxG(D)xPDXx(I)

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	TALFOELY--DRNT-----SAB---TLYEVLLGLI--QR	2737
TETRAHYMENA	QLLLHSMF--MKEE-----SADROQKLDKILSNIL--AK	2935
STYLNCHIA	VEIFSELY--KSON-----DQQORELLGQGVNRII--NE	2906
APHANOMYCESa	SALLNVMI--PTLPS-----SIQTVQVGFYFETLL--E-	2570
APHANOMYCESa	SIIILSHVL--PNLSA-----STQSQVITKIEALL--Q-	2505
PYTHIUM	MAEVMASVV--ATKSF-----DEGTLRTLGMARMSAL--T-	2744
PLASMOPARA	DELFSSTIV--ATNEFE-----KSGIVDELTEKLEGTTI--T-	2712
BREMIA	SALFSSIT--GNYQFE-----KIGIAKRLTEKLNETT--I-	2696
AEDES	VAFISGHI--EEDQNN--EV-----DSR--EAIAGDGSIQKIF--TE	2788
MIDGE	IISIFOSH--QILRQK--ES-----GEETENDFPQISNNSTMSILKQNLN	2767
BOMBUS	IVNVVCSHI--ENCR-----QSSFIKGLVDSMETHM--EN	2639
ANT	IVALFYSH--KETTER--EK-----SDDFRLTIVEMKOL--HK	2696
WHIPWORM	LEADMCGL--EHSRN--ER-----QGESAKFFGATISLLADML--SN	2739
TRICHINELLA	ESLMCSVA--ANVIEI--YN-----FEMTEKYFSDISDGLRDI--RS	2743
BEEBLE	EKFKLSHI--EKRR-----S-----DANPIQEISVIGIQTIF--NN	2611
BARNACLE	LAGLLVCHI--HELDA--EQRPSPTQSRKRPAAGVGADQLRDVSSGLESV--RR	2672
THRIP	MVSLVGVK--EVIDAS--DN-----SNDFKLTSASLNNV--KQ	2704
FLA	LHSIYCHI--AELD-S--ES-----QKHFIKEINQSIENIF--RK	2691
WHITEFLY	IVALFKSFI--DEES-L--QG-----ADDFYREVMASTGNIL--QN	2765
TICK	LTSTVKNIV--KGA--DL-----PELC-RELEVALSSIT--VT	2728
TERMITE	FVLLFDGLI--GELY--DE-----KEYVTQKVKAMGSIV--ST	2777
DAPHNIA	CHLLVLR--QQVREI--QG-D-----DKEFASKLNTLSQSI--EN	2557
OSTREOCOCCLUS	REFFSVAM--EPEFYSRKH--GGDLHADHKGGLRTRDKKNVGGIARALKGF--SK	2735
STENTOR	WTFITALE--TFFD-----DAKRRITGCLARIE--BI	2446
KLEBSORIDIUM	BAGLFRAN--ALPSTA--LR-DGE-----NDVRBPVRECVAAAL--A-	2929
CLUBMOSS	LSSIFGFW--QND-----V-----TTVKTEIRTFENAL--E-	2652
MOSS	LRLCSNVY--SLPSGG--Q-----DIIKAEVRLGLEAAL--R-	2797
LIVERWORT	VTVICRNVY--SQPAGR--QE-DIT-----SDIKSOMTOGIGKAL--E-	2833
LIGNANO	CAQLGOSMV--DWAASA--LS-EDD-----VADMCRRLLAAWLGVL--IP	3039
COPEPOD	SGVILGHL--DVNAEL--LN-DEG-----LEEIMEIFNNIF--NN	2685
GLOBOSUM	MTIILLKMLDNTIDLE--KL-----TQAINGVF--KT	2636
PALUSTRIS	SSLVASVL--GHVDDYK--GM-DEE-----RKEEYKSVIERHLODIL--NR	2714
NEOCALLIMASTIX	IMILESIV--SKDEI--MN-DKE-----CNQFTEKVEKINNIL--QN	2804
GLOMUS	TSLFVSIY--NQLDNN--IQ-SEE-----IKEYKTIQRHQQDIF--SN	2856
LOBOSPOR	SKLVISSHI--QQIDSH--VE-SEE-----EALSFKDGLIRDFKNIL--QK	2794
SYNCEPHALASTRUM	HAHIVVSH--QYADRY--LQ-DKR-----PDMQNVILVQVQK--AN	2776
FUNCTIVORUM	HAHFALLE--QAAQD--MD-----LQYR--GIDRE--K-	2760
HALBUM	SLLPFIYI--QHCPRD--QV-----NKFSSCKQSEKIL--D-	2913
DUPURPUREUM	SLLPFSIY--NKTQOE--NI-----RSPQNKIKKLESIV--D-	2889
PVIOLACEUM	SSLPFIYI--KNSKQQ--QQ-----KDEIKQALFPIV--D-	2894
AMPHIPOD	VLLCEGLI--RHGEER--LS-ETQ-----LKNWREERSALSTLIL--VE	2852
SHRIMP	EVLACQVI--NSAGTA--MH-HRE-----EQWNQELHEALNGIL--SS	2820
MUDCRAB	DVVVQVIV--DNADSL--MT-RGE-----KDTWIQQLHSSVNVII--AN	2813
TARDIGRADE	LRNLFQGIY--AQARTK--SE--K-----VDELEKLAKRLEGIL--KH	2851
HYDRA	VSLFLAIL--NQLSQ-----S-----SESILLKQNTLNIIIM--QS	2718
SALPINGOECA	ESLFIYVI--HELPTI--LS-ERD-----AANMKAENYKAVNGLI--QA	2854
SPIDER	LKSLSMIC--TSVKED--FP-EG-----FEAFCAQIGSCFENIL--QK	2823
LIMULUS	ITSVAKMLC--QSEEN--HP-HD-----YIVLCNELKQVFNHIL--QQ	2871
SCORPION	QSLILVHC--CTMKSN--QV-TE-----YSEFCRSLSSALAEHIL--KK	2835
ROTIFFER	ESIFVSHI--SEISYL--KD-EQD-----SVKILKELTYOILMAM--AS	2772
CIONA	LSSLVCHIL--KEERKR--DG-E-----ENTPANTGDKNFOIL--EI	2854
OCTOPOUS	NSLFKGHI--ADAEQE--KG-DED-----METSIOQVONSIRNML--KA	2787
CAPITELLA	VAVFOATF--TQIESE--KT-ERE-----SQSLVAKIESSLNKLIL--ET	2833
LIMPET	SSLFKAIY--KKMDEV--KT-ERE-----MEETIELNTSVETMF--NT	2812
SCALLOP	SELFKAIY--DQMDQV--KV-ERE-----IEPIVEIQKDSLSTVL--SQ	2875
LINGULA	SALFRATF--SELQDV--KT-ERE-----TTEMAQISRSLNAML--DS	2839
OYSTER	GATFKGHI--SKMDEV--KT-ERE-----VQETIQQIKSIVGVIL--TT	2833
SNAIL	GAVFKAIY--QEMDKV--KT-DQE-----MEETKEKISDSLGRML--ST	2843
SPONGE	CSLFNSIF--SQLDHL--LT-EED-----AAATKGVIEGNINTIL--DC	2868
PRIAPULA	SSLCDQVY--RRAGDT--AT-ERD-----VDATMEKLEAVSVMA--SS	2880
DANTO	SSLFAGVI--VEMERL--KS-NKE-----TADILKELVQTLNAPL--NK	2855
ESHARK	SALFSGHI--EVIKIS--KT-A-E-----TKDTSQVLVENHIL--KA	2862
BHARK	SSLFSGHI--EVRKKS--KT-AAE-----MSGIGKELLKHTFPLI--NT	2855
XENOPUS	SSLFSGHI--TDTAS-----D-----DISVTDKLLKQPNFSL--SN	2865
STERLET	SSLFSGHI--IEMEKS--KS-QSE-----KKRITEILLQDMNFI--SK	2872
GAR	LSTLFCGHI--AQMEGS--KN-EAE-----KRRITEELLQDMNHFI--NK	2869
HUMAN	SSLFSGHI--KEMDKF--KT-LSE-----KNNITQKLLQDFNRFI--NT	2846
PLATYPUS	SSLFAGHI--KEIDKF--KS-QSE-----KRNITLKLQDFNHFI--SS	2853
TASDEVIL	GSLFAGHI--KEMDKF--KS-PSE-----KKSITEKLLLDPNYFI--SS	2857
COELACANTH	SNLFTGHI--TEMEKS--RS-DSE-----RKTILLELLGNFNGFI--SN	2863
CABECILIAN	SSLFPGHI--KEMDKL--KS-SSE-----MKDITQKLLADFNRFI--NI	2865
CANARY	SSLFSGHI--HEVKKK--KH-PSE-----KNAIIVQKLLANDFNFI--SM	2854
OSTRICH	SSLFSGHI--REVEKS--KT-PSE-----KKIITQKLLKDFNQFI--SM	2824
GECKO	SSLFAGHI--EMERKS--KS-QSE-----KNSIIQQLVQDFNCFI--TF	2863
TURTLE	SSLFSGHI--KEMNPF--KN-PSE-----KNCITQKLLQDFNFI--SM	2863
ALLIGATOR	SSLFSGHI--KEMENS--KS-PIE-----KTHIVQKLLQDFNFI--SI	2821
APLYSIA	SSLFQATF--RAMDQV--KT-ERE-----MEELTAQINRSMESLI--AQ	2889
TRICHOPLAX	VN--LIV--NDLVEN--FN-DED-----AAETKAEIKASLSNIV--KK	2840
SOFTCORAL	SGIFRGHI--SQIDEN--VT-DTQ-----ADELFRIDQDALNNMI--TS	2860
STONYCORAL	SALFRGHI--SKIDEX--LP-ERE-----AASVTSDLRSAMNHMI--SS	2888
SEA ANEMONE	SVLVQATL--SQMDEK--LT-EQD-----AEKVTDTIQGALDNIM--TS	2843
SEACUKE	CSSIFGHI--VQIGEK--KT-ERE-----AEELVKNIQVLNQMI--SS	2862
LANCELET	SSLFRGHI--EEIENV--KT-ERE-----AEDLTCIEISRLNTAL--SN	2889
STARFISH	SSLFRGHI--SEIEEV--KT-ERE-----AESTKVINRHNTMI--ST	2904
SEA URCHIN	SALFRGHI--ARIGDM--CT-DGE-----TELVKVGIERHNLQMI--TD	2886

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----SCKTFTIISVLRTPHQVLCKSGILL-----	2764
TETRAHYMENA	-----SIVHDFNVSLHKTMI-MLTKEGELP-----	2961
STYLNONCHIA	-----SILYDYGICLCHRVAMELLKTDGPTI-----	2933
APHANOMYCEsa	-----SAQHNTLVVAALHQAYIGLLCQSKS-----SVTL	2599
APHANOMYCEse	-----QSQHNTFFVASLHQAYLSLRH--P-----STLL	2532
PYTHIUM	-----TGKSSLVFISSAVHLTYYSICIMRKSAT-----QMLS	2775
PLASMOPARA	-----LSKASSVYVGCIVSAYVASMIRHPSLF-----NIPV	2743
BREMIA	-----LSKTSSTIYVGCIVSAYLKAIIIGNPRLC-----DLIP	2727
AEDDES	-----TKNCDPNLFCMLIEVAMM-----RPKLF-----N	2812
MIDGE	-----SKNSDFTLMMHLEMTMK-----SGKYL-----E	2791
BOMBUS	-----EQNSNSTIQAHELEI-----LLNASIT-----D	2661
ANT	-----SCERDSSVQHELETLILLSRDAIIVA-----D	2724
WHIPWORM	-----MSACYRPISSIMNYLYR-----PVDLV-----T	2763
TRICHINELLA	-----MVTFHRPIASCLMNFLYN-----FIEYV-----H	2767
BEEFLE	-----SSEFSRNLFRALFDALIF-----SKSSI-----V	2635
BARNACLE	-----LRTAEPSSLVSNALQTALD--AE--I-----A	2694
THRIP	-----SKNFEPSTICACLEIAYH--CQ--F-----S	2726
FLEA	-----SOLCNSNIMRIFEMALE--YPKLM-----N	2715
WHITEFLY	-----SLSFNPAITGAPFEVSYF--CHEKI-----N	2789
TICK	-----SDRCFPPLVDFVQETSFS--CAGGL-----K	2752
TERMITE	-----TKDYTTMVGVMIEIALC--HSRYI-----T	2801
DAPHNIA	Y-----RLRSGNFNLVAVILEYFWT--NTDEI-----S	2583
OSTREOCOCCUS	-----IEGGDASVRFPLSLCEF--IPKAT-----D	2759
STENTOR	-----SEHNSDVSSEHKTARE--LVSKN-----AKFSKE	2475
KLBSORMIDIUM	-----RTRRSTSVSHACICLE--DPKMR-----	2952
CLUBMOSS	-----RTHSESTIYGHQDLCLK--DRDAW-----	2675
MOSS	-----QTHNGLSFVCAEALCLE--DPEIW-----	2820
LIVERWORT	-----KTSNGISFVCAEALCLE--DATIW-----	2856
LIGNANO	TSPFDGKRRNGLSAVTAATNDPALIGCALSLCA--VASSACDGGVGVVDVGAIIRP	3095
COPEPOD	-----TTVVSTDFIGGLDVCIH--MNPSD-----V	2709
GLOBOSUM	-----SLMSSSPLIGSLDMLH--NNGII-----QG	2661
PALUSTRIS	-----SVNLHPPVIAVLRVLYQ--MPV-----TA	2737
NEOCALLIMASTIX	-----TINYDFSTIHALTFCLK--EN--I-----Y	2826
GLOMUS	-----STMNFPPFIGSCLRICYE--VNDI-----E	2879
LOBOSPOR	-----STLYTPTFIGSILRICHD--YGQV-----D	2817
SYNCEPHALASTRUM	-----SFLYFPFIGSFLRVCID--LMAA-----A	2799
FUNCTIVORUM	-----TSSFGGFIGSMLICYH--QNRH-----	2783
HALBUM	-----SNATNSALILSLKIVEK--NLELT-----	2936
DUPURPUREUM	-----CQKYNSTIANSILISEK--NLEFS-----	2912
PVIOLACEUM	-----KCRFNTSLVSCILNIFEK--NLDS-----	2917
AMPHIPOD	-----SVQNSAPVMAVHLHLLS--AKI-----M	2874
SHRIMP	-----SYMCCPQMLRIVLHLMIN--NDV-----R	2842
MUDCRAB	-----SYMCHPMLRIVLHLVIN--NDI-----L	2835
TARDIGRADE	-----QNVTDITFLSHLNIILQ--DSPKE-----SKLLES	2880
HYDRA	-----SIFYDSTFINAVETVCLK--NKEM-----N	2741
SALPINGOECA	-----TRKGYTPTIIMLHMLRA--SDPAI-----	2877
SPIDER	-----SYLYFPPFIGSCLTLN--DFPNI-----R	2846
LIMULUS	-----TVQFPPFIGFVEEVCYH--SVQHL-----P	2895
SCORPION	-----SVHYHPQIIVYBCLNC--DVKEH-----D	2859
ROTIFFER	-----SESFNSNFVHELEICIK--NPKLL-----K	2796
CIONA	-----STEKNPSSIASVEEVALR--NHQYV-----GFNK	2881
OCTOPUS	-----SEQHFPFIGSMLNILYD--MDKEL-----P	2811
CAPITELLA	-----STQYFSPFIGSGLIAYL--FPKQL-----K	2857
LIMPET	-----TSQYFPPFIGSMDIVYV--LRSRL-----K	2836
SCALLOP	-----SVQYHPPFIGSMDIVYQ--LRSQL-----S	2899
LINGULA	-----STQYFSPFIGSMDIVYV--NSGRL-----K	2863
OYSTER	-----SIQYFPPFIGSGLDVLYS--LRSKL-----K	2857
SNAIL	-----SIHYFPPFIGSMDILHT--LRSLL-----K	2867
SPONGE	-----STQYFPPFIGSGLDICY--E-NSL-----K	2891
PRIAPULA	-----STSIFYSPFIGSGLDVCYR--NISIL-----R	2904
DANTIO	-----STVYFPPFIGSGLDMSYH--HKALL-----G	2879
ESHARK	-----TTLNFPFVFIGSGLDMSYQ--HKOLL-----G	2886
BHARK	-----TTLCPFPFVFIGSGLDMSYQ--HPDLL-----N	2879
XENOPUS	-----SLSYFPPFIGSGLDMSYQ--HDELL-----H	2889
STERLET	-----TTVYFPPFIGSGLDMSYR--HKELL-----N	2896
GAR	-----STLYFPPFIGSGLDMSYQ--YKELL-----K	2893
HUMAN	-----TFSFPPFIGSGLDMSYQ--HAALL-----S	2870
PLATYPUS	-----TVSFFPPFIGSGLDMSYQ--HTELL-----N	2877
TASDEVIL	-----TMLFPPFIGSGLDMSYQ--HSELL-----S	2881
COELACANTH	-----TTVYFPPFIGSGLDMSYQ--HAELL-----N	2887
CAECILIAN	-----TTSYFPPFIGSGLDMSYH--HTELL-----N	2889
CANARY	-----SLSYFPPFIGSGLDMSYQ--HRELL-----E	2878
OSTRICH	-----SMSYFPPFIGSGLDMSYQ--HRELL-----E	2848
GECKO	-----SVLYFPPFIGSGLDMSYQ--HKELL-----D	2887
TURTLE	-----TVSYFPPFIGSGLDMSYQ--HRELL-----D	2887
ALLIGATOR	-----SVSYFPPFIGSGLDMSYQ--HKELL-----D	2845
APLYSIA	-----STHYFPPFIGSGLDMSYQ--VRSLL-----K	2913
TRICHOPLAX	-----SKHYFPPFIGSGLDMSYQ--Q-KEL-----S	2863
SOFTCORAL	-----STQYFPPFIGSGLDMSYQ--E-GKL-----S	2883
STONYCORAL	-----STQYFPPFIGSGLDMSYQ--ECKLR-----S	2912
SEA ANEMONE	-----STQYFPPFIGSGLDMSYQ--KSMLE-----K	2866
SEACUKE	-----SSQYFPPFIGSGLDMSYQ--HSKEI-----S	2886
LANCELET	-----SEKYFPPFIGSGLDMSYQ--EPRKL-----S	2913
STARFISH	-----STQYFPPFIGSGLDMSYQ--HSEQL-----T	2928
SEA_URCHIN	-----SNQYFPPFIGSGLDMSYQ--HSEQL-----T	2910

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	PENK-I VKKI T E P S L A Y Y G S M I L L E F C I L R L Q E D N E N	2800
TETRAHYMENA	D-SN-I I K Q S L L S H S Y Y T S I L L I R E S L F S L F H R I D Q N E Q A G D K D V L	3012
STYLNONCHIA	E-AN-I I Q R N C O H S M S F Q T L A L I E S I I H G K I Q I D E Q F Q Q	2972
APHANOMYCEsa	LSPD-I I G T S I S S R N L V T G R I L E L L I H S T D	2631
APHANOMYCEse	LAPD-I V G I S S I A S R N F T T G R I L E E I I R A A D	2564
PYTHIUM	ISAK-V V G S S L A S G L H S E L L I E F L T R G V A	2807
PLASMOPARA	LRPK-T I G D N G L S G N H H V S L A L E L L I Y E T Q L M	2780
BREMIA	LRPE-T I G D N G L S G K Y H I C L A L E E I L T Y K I Q	2761
AEDDES	LPAE-G V T V Y S G N M M T M V L Y L E S K L H E Y D	2847
MIDGE	ISPD-V I V N I S V M N M M V T G V L F L E S Q L N Y L L N N E E N N E T D E I E E P Q Q	2838
BOMBUS	CSPE-I T T K S R S S L A N F S L S V L E E N L I H E T N	2699
ANT	CDPR-D I V K S R A S H L A N T G A L I V E S L L P H V Q E D	2765
WHIPWORM	FSPQ-D W A Y L A R S Q P D C S I L L I R C V E S G D I L E	2804
TRICHIANELLA	FEPT-D I A N Y I G S Q P D C S I V L L E R R I E V G F V D I	2808
BEEFLE	FPPE-L I V S V Q S S L R G L G A L I L E Y L I S C D V T E	2675
BARNACLE	LPPA-L L A S V R L S G L P A C I M L L E R T L R Q P A A V E	2733
THRIP	LDPH-L V A B V L G S N L L A L G V L L E A A	2752
FLEA	IGPD-V I S L V H T S Q L L S L G A L L E N R L N G E F	2753
WHITEFLY	LDPD-A V S T N Q A S G L L S L G T V V L E N Q I S A L S E S D	2830
TICK	LPVD-A V A R S V A S G H Q S L G I L V L E E V Q R V R A	2792
TERMITE	LQAE-D I T T V S R F S G L L A T C C I L E E I L I Q K D	2841
DAPHNIA	MDSG-K I V H I L K G S H L Q A L C I L V L E S C F P D C P F P E	2619
OSTREOCOCCUS	IPIS-D I V L I R R E S E L A S V V A L E S L I S S E K	2791
STENTOR	INAK-F V A S E L S R M C I Q S I L L E E C L L R Y D A N L	2512
KLEBSORMIDIUM	VEAR-S I C D S L A S R M H Y H S C I L V E N Q L L D S Q S D E G	2992
CLUBMOSS	IKPE-V A G S S Y N S Q N F H S I L L I E K Q I L H G T R P N L	2711
MOSS	ISPK-I M G S S R K S T N Y H S I M L L E K Q I M N E T F P E P	2859
LIVERWORT	IQPR-L I G O S L K S T N F H S I L L I E O E L L H E T F K E T	2896
LIGNANO	SDYG-L V A A N S A S A H L P T L C A L A L E L L Y A W Q R G P G V Q Q Q	3152
COPEPOD	LDTK-K I S N I L S G L E Q I C I L L E K Y L I Y R K D S A	2748
GLOBOSUM	SSPS-L I S H V S A S N F E L C A L I I E K G L E D D L	2697
PALUSTRIS	CSPQ-L I F R S E G S A N S E L C I L L E K L A N D A P	2773
NEOCALLIMASTIX	IDTN-I L K T I G M S N N Q S T A I L L I E N I H L N H Q E	2858
GLOMUS	IDPN-M I R K N G I S S T E S T C I L L I E R Q L L R T S	2915
LOBOSPOR	ISAE-L V A R S I R S S N Q H L C I L L I E K Q I Q E H G S	2854
SYNCEPHALASTRUM	IDST-V N N V S E R S E M Q H A I A V L E A Q L I S G A S E A	2838
FUNGIIVORUM	VSPAF-L S A S E L S R M F H S I L L E E K O L S Y S Q N L	2817
HALBUM	PSPA-S I A S S E N A S N H P M C I I V I S I I E S L L P T	2973
DURPUREUM	PEFS-K I K D C L A S N N H P M I L L I E K L I L K L Q S H	2945
PVIOLACEUM	PTYG-Q I T N I L K S N N H P M A I L L I E K L I N I V L N N	2954
AMPHIPOD	ADPK-L I T N I L S G O E S L C I L L I E N V L M I R K D V	2914
SHRIMP	TNPE-S I T A N G L S R L E A L C I L V L E R Q A L L S K R G E	2882
MUDCRAB	VSPD-A L A A N G L G H L E A L G V L V L E R Q V L L S Q K G L	2877
TARDIGRADE	VSAA-A V T S N A K S S O P N L C I A V L E N A I L L Q S A	2916
HYDRA	LEPQ-V V S S S I I S L Q O P T C I L L I E K Q L I S L K N N I	2780
SALPINGOECA	VSPM-T V S L S A A C R S F H T C A L L L E S T L A A A E E E A	2916
SPIDER	FDVE-T V F R N G I S S Q O S T C I L L I E T Q L L D G L T V	2883
LIMULUS	LEPE-E V S R V Q A S G Q Q M C I L L L E E I L I K S T T E E	2934
SCORPION	IDYE-Q I C T S O S H K Q S L C I L L E D H L I C A N F K	2898
ROTIFFER	LDPG-L V S E L A S F R O S I C I L L I E Y I I M F E E D S	2835
CIONA	LIPA-H I S S S L A S N K H A L C I T L L R O Y I I D D K H S V	2920
OCTOPIUS	IDIKQ I S S S I T K L Q P L A I V L E Q I I K G M N S C	2851
CAPITELLA	LQPG-V V S V N V N S D Q O P L C I L L I E G L L H S P E	2895
LIMPET	ISPS-N I S T S I V S S L O P L C I V V L E Q L I Q T D S	2874
SCALLOP	VDVT-S V G S S T F S N L Q P L C I V V L E Q L I H N P	2937
LINGULA	LEPS-A V D T S L I S M Q O P L C I V L L E Q L I R D G S	2901
OYSTER	VDVS-D V S S N M F O N I O P L C I V L E Q L I S Q D E	2894
SNAIL	VEVS-E L S I N K I S N L Q P L C I V I E R L I T E D S	2905
SPONGE	IKPP-S I T T S S L A S K Q E F T C I M L L E K Q L L A N V D	2928
PRIAPULA	LDPA-V V T V S Q T S M Q O M L C I V L L E K M L M Q G A C D D	2943
DANTIO	VEPS-L V S A S C L A S L Q O P M C I L L L E S L L H G A G A S	2918
ESHARK	LDST-S V S S S L A S L Q O P M C I L L E K S L I H S T T N	2924
BHARK	LDPN-I V S S S L A S L Q O P M C I M L L E S L M H L S L P	2917
XENOPUS	LNPA-N I S T S L A S L Q O P L C I L L L E K G L L H M K V P	2927
STERLET	IEPS-S V S S S L A S L Q O P M C I L L E S L I K G L V P	2934
GAR	VDPS-A V S S S L A S L Q O P M C I L L L E S L I R G S V P	2931
HUMAN	LDPA-A V S A C L A S L Q O P V G I R L L E A L L R L L P A	2907
PLATYPUS	LDAN-C V S T S C L A S L Q O P V G I L L L E Q A L I R L G P P	2915
TASDEVIL	LDST-T V S T S C L A S L Q O P V G I L L L E K A L I H L T P A	2919
COELACANTH	LDPA-S V S A S C L A S L Q O P M C I L L L E Q L I Q L L A A	2925
CAECILIAN	LDPN-N V S T S C L A S L Q O P V G I L L L E R S L M S L V D T	2927
CANARY	LDSA-N V S T S C L A S L Q O P M C I L L L E R A L M A L S P A	2916
OSTRICH	LDSA-N V S T S C L A S L Q O P V G I L L L E H A L I S L S P A	2886
GECKO	LNPS-S V S S S L A S L Q O S V G I L L L E Q A L V H L S S E E	2926
TURTLE	LDSA-T V S T S C L A S L Q O P M C I L L L E Q A L T R L S S E	2925
ALLIGATOR	IDST-S V S T S C L A S L Q O P V G I L L L E Q A L I H L S T P I	2883
APLYSIA	APAS-E V G V S I V S N Q O T L S M V V L E Q L I Q A S S A Q	2952
TRICHOPLAX	IQSS-F A S V S L A S S O O P I C I L L I E K Q I M H L D	2900
SOFTCORAL	LEAG-K V T T I G S L Q O P T C I M L L E K Q I L Q M A E D P	2922
STONYCORAL	VDSA-S V S T N L S L Q O P I C I M L L E K Q L L E I E G	2950
SEA ANEMONE	VQPS-S V S T S L A S L Q O P M C I L L L E K Q L L S Q E	2903
SEACUKE	LDPV-T V T V S L T S K Q I H L C I R V L E E M L I K K S W	2924
LANCELET	PDAS-V I O O N V I S L Q O P I C I V L L E E Q L V K R A G	2951
STARFISH	LVPS-T I S T S L T S Q O M H T C I R L L E E N L I Q K P W	2966
SEA URCHIN	LDPA-A I S O S L T S R Q L L I C I R V L E E V L I K K S G	2948

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----QFIRKSPFFM	2810
TETRAHYMENA	LKNQKASRARGKEMQIGEDDYEDKLDENEEDLEEEERLLYESRKKQSEKRLVNYM	3072
STYLONCHEIA	-----AMGQGNKKRRIQDMSG-----QNKNGTGFMPN-----KVLGDKRKYF	3012
APHANOMYCEsa	-----ENVTSAFN	2640
APHANOMYCEsa	-----SRIVSMAN	2573
PYTHIUM	-----SSADVTAEAAD	2818
PLASMOPARA	M-----KLKSNESLVECD	2794
BREMIA	T-----DLELNLVTVNC	2775
AEDES	SISRR-----SSSVTLEALHI	2864
MIDGE	KRIKL-----DMNDDIKLHHIL	2855
BOMBUS	KKIR-----RKYADSSSKVL	2715
ANT	KRMH-----SDNYICNEETSKE	2784
WHIPWORM	RRLSD-----DSDSSMPLESAIT	2822
TRICHINELLA	KRLKQ-----VNETDRLAV	2822
BEEBLE	R-----GNQLSQDTNLI	2688
BARNACLE	KRPRLGLPP-----PAAEPARDRRLS	2756
THRIP	-----ATWNVNVL	2761
FLEA	KRSTI-----EDNDEYNHL	2768
WHITEFLY	KRQL--DR-----MDETNLTEEANIIF	2851
TICK	KRTRK-----EAAQACGPI	2807
TERMITE	KSKTF-----EPSTEIIL	2856
DAPHNIA	KPKRQ-----EVKHQSSVF	2634
OSTREOCOCCUS	-----DGSSETF	2799
STENTOR	AQSGTE-----KPEVTRKNSFVI	2531
KLEBSORMIIDIUM	R--SKRQKGRGQ--AVP-----RGQGESEGEQETVI	3022
CLUBMOSS	A--AKRHRGFSVQ--TSQ-----D--NAVTEEANL	2735
MOSS	S--SKRQKGGGQ--ANR-----L--PRPLEDANL	2883
LIVERWORT	S--SKRQKGAAGK--VMK-----E--QRNMQEANL	2920
LIGNANO	LPTA--AKRRRMEAGSQESNDNSA-----DVGTHADRHEEAYL	3191
COPEPOD	KKKKIT-----SQDQKVEYLI	2765
GLOBOSUM	TKKLTFF-----NRVAVRKSPEAVV	2716
PALUSTRIS	KRSRTGR-----NASKKQSEIEFV	2792
NEOCALLIMASTIX	KSQ-----SIDSDNKRLLN	2873
GLOMUS	KRLRTTS-----SSLVASSKRPI	2934
LOBOSPOR	KRLKTSG-----ATSHDPKRGSI	2873
SYNCEPHALASTRUM	KRKRITGG-----SADLHRSKVQI	2857
FUNCTIVORUM	G-----KTERDGEIA	2827
HALBUM	KQYQN-----QATISESD	2988
DPURPUREUM	KQO-----EKDINSGD	2957
PVIOLACEUM	KTPDD-----NRVIDDAN	2969
AMPHIPOD	KRQKRGVTS-----LAQSEDDVPKLM	2938
SHRIMP	KMKRKA--E-----AL--SQDSSLIL	2900
MUDCRAB	KKLK--TH--L-----NS--QLDSTVI	2894
TARDIGRADE	KRARQK-----ASVKADYIL	2931
HYDRA	KRLRAD-----SQQENYMWIS	2796
SALPINGOEA	KRSKMRRAR-----NGLTDDEIERI	2937
SPIDER	KKIRHE-----KHIFTQESNYM	2901
LIMULUS	KKARRE-----NRSNSPATSLI	2952
SCORPION	KRIKLN-----KPLISDELISIL	2916
ROTIFFER	KKVLN-----PKDSSSEASTIL	2854
CIONA	KKQKTH-----VSGMGNPVLHI	2938
OCTOPUS	KRPQRS-----LNPPPTDVSTL	2869
CAPITELLA	KRSRRD-----RSSRIQTDTPEL	2914
LIMPET	KRRKTE-----GTTVSTDVNLI	2892
SCALLOP	KRGRTD-----TLTISKEVPTI	2955
LINGULA	KRARTS-----ATVPSQESTVL	2919
OYSTER	KRGRSD-----NAVVSTDTLSI	2912
SNAIL	KRSRYD-----VTPVTKDDMI	2923
SPONGE	KRSRTN-----KSNEVTETI	2944
PRIAPULA	KMRA--G-----SGMGVSHQHTDI	2962
DANTO	KRARG--K-----RELPPDT--ERI	2935
ESHARK	KRARG--R-----RELPPDTVARI	2943
BHARK	KRSRG--R-----TQLPPDT--ARIV	2934
XENOPUS	KMKRKEKEK-----AEIPDDI--VRHI	2947
STERLET	KRARG--R-----RELPPDT--ARI	2951
GAR	KRARG--H-----RELPPDT--ERI	2948
HUMAN	KRVRG--K-----ARLPPDV--LRIV	2924
PLATYPUS	KKRRG--K-----PQLPPDV--VRHI	2932
TASDEVIL	KMRG--K-----PQLSPDV--IKHI	2936
COELACANTH	KRARG--R-----KELPPDT--IRIL	2942
CAECILIAN	KMRG--K-----TELSPDV--VRHI	2944
CANARY	KMRG--R-----TELSPDV--IRHI	2933
OSTRICH	KRVCG--R-----RELPPDV--IRHI	2903
GECKO	KMRG--K-----TELSPDV--IRHI	2943
TURTLE	KMRG--R-----ALSPDV--IRHI	2942
ALLIGATOR	KRMCG--R-----TELSPDV--IRHI	2900
APLYSIA	KRARRE--A-----E--TLDADTVLHI	2970
TRICHOPLAX	KRIKTS--S-----ASEATSNHI	2916
SOFTCORAL	KRQKTG--G-----N--PSPSTATI	2940
STONYCORAL	KRAKTS--T-----V--PPSEVTICHI	2968
SEA_ANEMONE	KRMRTS--H-----S--PSSDTTAAHL	2921
SEACUKE	KRSKTS--H-----R--ETTREISTHI	2942
LANCELET	KRARTS--S-----S--PVSAETATHI	2969
STARFISH	KRARFV--S-----R--EPSPEISTHI	2984
SEA_URCHIN	KRARTS--R-----P--ESNQEMSTHI	2966

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	DIMDLHQSGCNKAOLEFHINELPKDKP-----AFDS---IKQAMD-----	2847
TETRAHYMENA	DLIDLSHLNKQOLKCLLKKTVSHEG-----QKDM---IVALDLKFSKIQNSL	3119
STYLONCCHIA	NLIDLVDQIGNDALQCLWFLADEEG-----IIFK---VKDQEKLSQOERNV	3059
APHANOMYCEsa	QLHHVLQMVENEPIYLLALATHE--ST-----VPET---TLAVEAQLKDLVAIL	2684
APHANOMYCEsa	QLHHVLQMVENEPIYMLLAET--CV-----LSET---NLALHAQLSCLVAMI	2617
PYTHIUM	HLVKLLATOKSLLTALAKSC--CV-----TDSD---KLALEARLADLPGAI	2862
PLASMOPARA	LLHKLLSTLHKRFVLLALAC--ST-----NADS---KRALQQLSCLPLAI	2838
BREMIA	LLHKLLGTVRKRFLLALAC--ST-----IPES---KQALEAQLSCLPLAI	2819
AEDDES	KLAEHLHALNEYDILGDIYSDK--MD-----SD-PRL---REALEESGNIPYKR	2909
MIDGE	KLIELLYKMEYEVLAGHTEK--LN-----LN-PETRHQLIKAIYDYESNRFPDN	2904
BOMBUS	LLTNVLRKSMNDVTVLSSHQNH---I-----TM-KDM---QLASFAQVSKKERK	2759
ANT	QLASLRSKLDVTVLSSHQGR--QF-----FG-QDV---QBALAEVSDITRK	2829
WHIPWORM	SLGRLLKALGGLNLRRETFETH--LQ-----VS-EYT---KLALKLEYVDLEKVV	2867
TRICHINELLA	ELARLVKQCGELLENLKVTKH--LL-----TT-EKT---KLALEMEAADLEGNA	2867
BEEFLE	KLAEVLKEMEWEVVKSTLEK--TQ-----CP-QEV---KNALAEASQKQKDR	2733
BARNACLE	VLAELVQVYGDORSARALGR--AD-----LA-ADW---SAALAEARDFLEA	2801
THRIP	HLAELVDGLGERVAHSTLLHN--VP-----LD-KTA---KDALVAHAEPVLRK	2806
FLA	KLAVLQSMADYDTTQCFMKA--LE-----CN-EDF---ARGLELEYSCLYMM	2813
WHITTEFLY	KLAEVYSLSESVDVLCITRDK--LT-----NGNVDL---IKATEKQLDQGR	2897
TICK	QMAQLVRSKLDGYTVRVLSCS--ED-----VD-AKA---KEALQKEAQCDSGR	2852
TERMITE	SLADLVKHMDEWVVRGTFHKY--LN-----CG-ENV---HKALKWETSHPDKR	2901
DAPHNIA	HVANLVGDQINQVNRVVAHL--TD-----C-KEST---KKAIESESKHWRP	2679
OSTREOCOCCUS	ALATLCKSLGHDNMLCLVNA--FP-----M-QSDT---MVAIEEMTSLQNSA	2844
STENTOR	ALTKVLRKMGDSANLKVVI--FKSK--SP-EMNDTI---RKALDFYSEELIKT	2591
KLBSORMIDIUM	QLARLREIGEDIVLSEVQEK--VA-----R-LEST---REALOALSDITRM	3067
CLUBMOSS	ELARLVNAIGEDVVLSELNLR--LT-----T-QSIS---HOALESQVRDRL	2780
MOSS	ELAEVLKALGENDIVLCLGTH--VA-----K-HEKT---RRALEIQLGDLRQL	2928
LIVERWORT	ELAHLVKELGEEIVLSEVQK--LT-----E-KPIT---QKALEAQLGDPGRCL	2965
LIGNANO	ALARLVDRMGEPDQCALRRCSRHNQEGVDNNDDEER---FNALDWCLSDVQLAL	3247
COPEPOD	HLSDLVRTAGEHENVKCLIQNSHEMN-----V-HEDT---KSALNFEANGVSEAL	2813
GLOBOSUM	SLAQLVKELQHVYVESIVESR--VA-----Y-SLVT---KEAISAEELDFETK	2761
PALUSTRIS	QLARLVRSMMNVVYRDLVETR--VS-----S-NHVV---KEATTAESLQDRL	2837
NEOCALLIMASTIX	NLAQLVRSKIGENIYRNIRESK--IK-----A-NQSL---KDALTEEVLCVQDL	2918
GLOMUS	ELSHLVKSDIGDGVVNSIVESK--IV-----V-SELT---KDALNAELADYALAC	2979
LOBOSPOR	ELARLVKSTDEKOVVKSIVETK--VA-----T-TEFT---KQALEAEVVDVDRV	2918
SYNCEPHALASTRUM	DLASLVKSVDEAIFQSLVNH--VA-----S-NDSA---KDAVESMRADVVEH	2902
FUNCTIVORUM	ELMKLVRALGDVTRKCHENK--LA-----H-TDIS---KQALAEYSBELLT	2872
HALBUM	HIRELVHALKEEDIVLSEALERQ--MG-----E-LPYT---KRALEAELSQVAIL	3033
DPURPUREUM	NIRELVKSLKEEDILMLSEKQ--MS-----D-IPPT---KKALEFELKQVWNL	3002
PVIOLACEUM	SLRELVRALKEEDILMLSEKQ--SS-----T-SEYT---KKALEFELKQVWNL	3014
AMPHIPOD	HLAELVSSLGMWDAVRGVLOSS--MS-----SLHGNT---REALHCESLKPLENY	2984
SHRIMP	STAEVYKLNLMNDVVRGVVQK--LG-----AIKEET---QKALEAEATNVHVQF	2946
MUDCRAB	NMAELVKNLSMWVVRGVIHSHK--LG-----RIKPET---REALAEATNSVQF	2940
TARDIGRADE	GMVQLQSDGQDTSLAGLIDT--VF-----KRSDEV---LSAIQMEARGAHDAA	2977
HYDRA	ELAKLVTSKDFVDSVITCSQ--IS-----T-NDVV---KRALAEATNDYSTL	2841
SALPINGOBECA	YLGRLVKELGDYDTLHCITSNQ--VL-----S-FEAT---QARLEAARDFDEBA	2982
SPIDER	KLAEVRSINQVVRVCHISLT--MG-----K-RDDN---KRALQHECLQVFEBA	2946
LIMULUS	RLAEVRSKLNMYDVVRCHISSS--VN-----T-QTES---QALEFEARQVTKL	2997
SCORPION	KMAELVKSLSDFVHCHISNS--LN-----I-QEET---QALEFEARQVTKL	2961
ROTIFFER	ELAKLVRSMDVDSKCHILVK--SD-----LVCEHT---ERCIQFEARQVTKL	2900
CIONA	ELARLVKSLDEFVLRCHISGD--SE-----S-NKST---AKGALAEEDVTPAY	2983
OCTOPUS	ELAKLVKSINEYVSLCHIKDN--VG-----C-QEVS---KMAIKAEIRQVSEAI	2914
CAPITTELLA	ELAKLVKSISDYVLRCHISQ--IG-----S-KPAT---RLAIEAETRDVRSNL	2959
LIMPET	EMARLVKSVENYVLRCHISGK--ID-----T-KPIT---QEMAMESKDYQTN	2937
SCALLOP	ELARLVKSVDEYVLRCHITGK--IG-----T-QDIT---QKAVSFEARQVYQK	3000
LINGULA	ELARLVKSLGDFVVRCHISSK--IG-----T-KKIT---QDAAEASRDYKTS	2964
OYSTER	ELARLVKSVKEYVLRCHISGR--IG-----T-QDIT---KEAVQMEARQVYKVV	2957
SNAIL	ELAKLVKSLGDFVLRCHISGM--LK-----T-KEVT---QLALIEESHSEKAI	2968
SPONGE	ELARLVKSLGDYVLRCHITNL--DD-----T-KDVT---RKALEAERQVLTML	2989
PRIAPULA	ELARLVKSLGDYVLRCHINDK--IG-----T-QTCT---QALQAEASDYKLR	3007
DANTO	HLAKLVRSKLDGYDVVRCHISGK--IG-----T-KSIT---FTALQAEAKDYAEV	2980
ESHARK	ELATLVRSKLDGYVLRCHISEK--IG-----T-KPIT---QKALLAEAKDYAEV	2988
BHARK	ELAKLVRSKLDGYVLRCHISEK--IG-----T-KSTT---QKALLAEAKDYAEV	2979
XENOPUS	ELAKLVRSKLDGYVLRCHISGK--IG-----A-KSIT---QCALNAAEKDYAKA	2992
STERLET	HLAKLVRSKLDGYVLRCHISGK--IG-----A-KSIT---SMALQAEAKDYAEV	2996
GAR	HLAKLVRSKLDGYVLRCHISGK--IG-----A-KPVT---SLALQAEAKDYAEV	2993
HUMAN	ELAKLVRSKLDGYVLRCHITSE--IG-----T-KQIT---QSALLAEAKDYSENA	2969
PLATYPUS	ELAKLVRSKLDGYVLRCHISGE--IG-----T-KHVT---QIALLAEAKDYSENA	2977
TASDEVIL	ELAKLVRSKLDGYVLRCHISGE--IK-----T-KPVT---QKALLAEAKDYSENA	2981
COELACANTH	ELAKLVRSKLDGYVLRCHISGM--IG-----T-KQVT---QKALLAEAKDYSENV	2987
CABILLIAN	ELAKLVRSKLDGYVLRCHISGK--IG-----T-KPHT---KDALAEAKDYATBA	2989
CANARY	ELAKLVRSKLDGYVLRCHISGK--IG-----T-KEIT---QKALLAEAKDYATBA	2978
OSTRICH	ELAKLVRSKLDGYVLRCHISGK--IG-----T-KEIT---QKALLAEAKDYATBA	2948
GECKO	ELAKLVRSKLDGYVLRCHISGR--IG-----T-KEVT---QKALLAEAKDYAEV	2988
TURTLE	ELAKLVRSKLDGYVLRCHISGK--IG-----T-KEIT---QKALLAEAKDYAEV	2987
ALLIGATOR	ELAKLVRSKLDGYVLRCHISGR--IG-----T-KEIT---QKALLAEAKDYAEV	2945
APLYSIA	ELSRLVKSLGDFVLRCHISDK--LG-----T-KDVT---RTALEAERQVKAAL	3015
TRICHOPLAX	ELSKLVKSLGDFVLRCHISGH--LG-----T-KDIT---QKALEAERQVAAV	2961
SOFTCORAL	ELSKLVKSVDFVLRCHISNSH--IG-----T-QSIT---KDALEAERQVTEAL	2985
STONYCORAL	ELSKLVKSVDFVLRCHISGH--IG-----T-KDIT---REAMEAERQVSOAL	3013
SEA ANEMONE	ELAKLVRSVEEFVLRCHISDH--IG-----T-KPIT---RLALEAERQVAAAL	2966
SEA CUCUR	ELARLVKSLGDFVLRCHISGK--ID-----S-HEIT---HSALQAEARQVAAAI	2987
LANCELET	ELARLVKSLGDFVLRCHISGR--VG-----T-QTVT---YEALAEARQVKKVV	3014
STARFISH	ELARLVKSLGDFVLRCHISGK--IG-----T-HEIT---KTALAEARQVSTL	3029
SEA URCHIN	ELARLVKAMGDFVLRCHISGAL--IK-----T-KDVT---QKATQAESRDYSENL	3011

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-YKHQYSYVRANQ----	OLE-ELLDEINQEGYDEDTIDGRMVHYLQQEFPEDTCMKLGQWE	2901
TETRAHYMENA	KILKEIISKNKESERQNFMAIEDNINNOVS---	LDRIQEQYIQSEYQDTLALMGKWD	3175
STYLNONCHIA	NLIKBAHCLRTKGSIDKGLK-VLEQAL-NDKSLTDCLEDHILCELENKQDSKAELLKWD		3117
APHANOMYCESa	QHYKDAEAKYAS-M-----	DN-A-----NVTILLERQWKEQGFHCLATLNRWD	2725
APHANOMYCESa	QHYKDAEGKFKL-L-----	DKSQ-----DVSLLQQRWKEQYINCLATLNRWD	2659
PYTHIUM	ASYRKAESVLTIS-E-----	WETEP-DFAVAQAQFANRCYWERLQCLTELNRWD	2909
PLASMOPARA	AAYKKAESTLRL-Q-----	MELLD-GDDFVIAKNDAMRCRQRLNLCMETLNSWH	2885
BREMIA	SLYKKAESTLHS-Q-----	MECLD-DATVVSVKADAVRCRQRYKCLTELNRWE	2866
AEDES	EIYLQMIKD-N-Q-----	A-----R-VAEQNFCQSYFNCAQMGWWE	2944
MIDGE	GIYDKLIHQ-N-L-----	W-----RNTSEKEFYQSKFFCLEKLSDWK	2940
BOMBUS	LAYEAYG---T-E-----	S-----ELMKHCLQGLFECLSNLCSSH	2792
ANT	WAFTHAYER-T-E-----	D-----PLIKHECLRGLLEAANLDCWS	2863
WHIPWORM	SVYTEALSK-L-D-----	DSNQ-----SSLYLAETDLWEESRLECLNELSDWN	2908
TRICHINELLA	TIYGETFSN-K-Q-----	SKSG---DIVEKAESNLLYEARIRCLEMLNDWK	2908
BEEBLE	DLYQSLLET-D-D-----	V-----IERKDFYDSYFKCFPHLGAWN	2767
BARNACLE	RHYEQTLRR-G-E-----	D-----HLSDQAYFQCLSELSEWQ	2831
THRIP	QQYFVALKD-T-K-----	Y-----DNFYESCFCMALLSDWD	2836
FLA	KCYERVVSG-T-T-----	SA-----INETERQPHKECYFNSFAKLGHW	2850
WHITEFLY	RHYFEVYKD-E-T-----	Y-----SEKQRFVTQSYFKCTALCSNWN	2932
TICK	DAYRNLSV-----	SGSIWDDAVLQCCRLGGEWT	2880
TERMITE	MEYEAALS-S-M-D-----	D-----QDGLSDYYEALYKCLLAHLSDWK	2936
DAPHNIA	EFYSQVFK--SD-----	TPSSAEMNFCDEYRLKCLEELGQWD	2714
OSTREOCOCCUS	NIYKNLLHNVDD-----	DQSPREREFWTHIEYFPCAEPLGQWD	2881
STENATOR	DEFLKIDNSDA-----	D-----DKQEMRDLLECAGSLQWE	2614
KLEBSORMIDIUM	QGYDKALMEMDE-----	MDQD-----SGTYSKLEADVCYNQRLCELSLFRWQ	3110
CLUBMOSS	VLYDKALNETP-----	EGTASKEEDLWYNYORLACLVDLFRWQ	2818
MOSS	DLYDQVIAIYE-----	DGSLSGDITKSEIDWYNYORLACLADLNEWE	2970
LIVERWORT	ILYDQALDVTDE-----	DSGSYGDQATQVEQDIWYNYORLACLDLNWNQ	3009
LIGNANO	ATFDRLFRQADE-----	SGTESASAAADSATAVNNACLARLDCLTRLADWS	3294
COPEPOD	KVYKNLVENL-N-D-----	LQE-----NHLKQEVDIWQKGYQSQSKLGKWD	2852
GLOBOSUM	NKYLEGLGSE-----	N-----LDVSEAEQLQWTTQRLECMNKLGEWS	2798
PALUSTRIS	RAYQALETE-----	E-----KLEHEADICHRGLVECLNKLGLWD	2873
NEOCALLIMASTIX	NIYSNTLENL-----	N-----QTTDEYEVSLCEQGRLECYNKLGSWS	2955
GLOMUS	KHYLEALKS-----	E-----ADVDDIEVALWEERRFDCFEKLCQWD	3015
LOBOSPOR	KVYFDGITKH-----	FANE-----IHVDVDEQSIWAHGRLECEHLGQWD	2958
SYNCEPHALASTRUM	ERFMDAFGR-----	FEN-----EADSRLELWQKELRCLCEQLAQWD	2939
FUNCTIONORUM	AEYERKTKLDEGA-----	RKGE-----EKISPTAEIDIWENRLECEPMLARWD	2918
HALBUM	KAYDDGMAALESQ-----	LA-----I-TPSARETSLWENGRLCQYESLREWS	3075
DPURPUREUM	KVYDEATSKLEQQ-----	LN-----QPHLSESETSLWENGRLECYAKLGNWN	3045
PVIOLACEUM	KTYDEATLKLLEGA-----	IT-----N-----ITDAETNLWENGRLOCLTKLRNWT	3055
AMPHIPOD	KFYLSALS--SP-E-----	V-E-----QSSEEQIWEERLCATASELGMWG	3021
SHRIMP	LLYRQSLD--TT-D-----	WEEE-----PLAAENRLWEEWYNSCAAILGQWS	2985
MUDCRAB	IYRTALN--T-Q-----	WPEE-----PDPAEVHLWEECYASCAAKLGQWS	2978
TARDIGRADE	DLYQQLIN--TR-----	-----DDSTLAVLQESHIRCLNELGNWK	3011
HYDRA	H1YRKAASQ--KE-N-----	WEIT-----PSYEEEEYDWTARLRCYENLGMWT	2880
SALPINGOBECA	EYKKECMP--KEED-----	EEDD-----DVPACEVDLWEDTLAECSLRLCDWG	3023
SPIDER	MLYNKLYE--EA-----	SD-----EHDQAEKDFWDSVIANLNLKLSKWE	2983
LIMULUS	QLYIQLYE--KT-V-----	WPKD-----EPEQAEMDLWDAILKCYDSLTRWD	3037
SCORPION	KIYSKLYD--QT-E-----	WSAE-----EPNQAIEDLWDNALCQYDYLQWD	3001
ROTIFFER	NEYGALD--S-E-----	LLE-----NVSQSQQLWLESLLKCCNELTDWK	2938
CIONA	KVYNEALH--KE-D-----	WEND-----VSEVEKDWEDCLINCFKNLARWD	3022
OCTOPUS	KHYVTAIE-----	-----LSTKEELCTWHHCYIQCLENLSRW	2947
CAPITELLA	QLYNESLA--KE-E-----	WDDG-----EHPTEAENIMWDSRIECAENLTQWR	3000
LIMPET	KLYDEALS--IQ-D-----	WAGE-----DPLEAIEDFWDSDRMQCLDHLTQWK	2977
SCALLOP	KLYDEALGYSDS-D-----	WPDG-----NPEMAEVDLWDDCRMECLDNLTNWN	3042
LINGULA	HLYREARQ--CD-S-----	WTDG-----EPDGLEQELWVDAYLLCVDQLMSWE	3004
OYSTER	KLYNQALS--CN-D-----	WDEN-----PPTIEVDMWDESMECLDNLSQWK	2996
SNAIL	ALYNKALE--SA-D-----	H DPR-----PLEAEIDLWDESMECLNRLTEWT	3007
SPONGE	NLYKKAID--F-D-----	WPGQ-----ESPQQEEDLWEDSLNAYSHLTQWK	3029
PRIAPULA	KLYQRALE--M-E-----	WGES-----EGPQQGERLDWISLMLQCLDRITDWT	3047
DANTIO	KLYNEALN--KE-D-----	WDDG-----EPTITEKDFWELAALEYNHLTEWK	3020
ESHARK	RLYDQALN--TE-E-----	WMDG-----NPMETEKDFWELAALEYNHLTEWK	3028
BSHARK	QLYDQALN--TE-E-----	WVDG-----NPTDAEKDFWELAALEYNHLTEWK	3019
XENOPUS	KLYDEALT--E-T-----	FSDG-----DPTDAEKDFWELAALEYNHLTEWK	3031
STERLET	KLYNEALN--TE-E-----	WTDG-----EPAAEKDFWELAALEYNHLTEWK	3036
GAR	KLYNEALN--TE-E-----	WMDE-----GPTDEKDFWELAALEYNHLSEWK	3033
HUMAN	KQYDEALN--KQ-D-----	WVDG-----EPTAEKDFWELASLDCYNHLAEWK	3009
PLATYPUS	KQYNEALN--MQ-H-----	WEDG-----EPSEAEKDFWELAVLECYNHLTEWK	3017
TASDEVIL	KQYNEALN--TQ-E-----	WLEG-----DPTAEKDFWELAALEYNHLTEWK	3021
COELACANTH	RLYDEALN--VE-E-----	WPDG-----EPTAEKDFWELAALEYNHLTEWK	3027
CAECILIAN	KLYDEALN--MP-D-----	WNSD-----EPTAEKDFWEVAALCYNRLTEWK	3029
CANARY	QYDKALS--QE-D-----	WQDG-----EPTAEKDFWELASLECYDHLTMWK	3018
OSTRICH	KHYDEALS--KE-D-----	WQDG-----EPTAEKDFWELASLECYDHLTEWK	2988
GECKO	KQYDEALS--KQ-D-----	WPDG-----EPIEAEKDFWELASLECYDHLTEWK	3028
TURTLE	KQYDEALS--KQ-D-----	WPDG-----EPTAEKDFWELASLECYNHLTEWK	3027
ALLIGATOR	KQYDEALS--KQ-D-----	WSDG-----EPSEAEKDFWELASLECYDHLTEWK	2985
APLYSIA	RAYREAMT--CE-S-----	WEDG-----DPLEAEVDFWDDNRMECLNRLTQWQ	3055
TRICHOPLAX	KYYNQAMD--CS-S-----	WPDG-----EPQAEEDLWEISRLCEYNYLQWD	3001
SOFTCORAL	KLYSQATN--CD-E-----	WPAG-----SSPLQAEEDFWDSDILECCRRLTLWD	3026
STONYCORAL	KLYNEAIG--TDDV-----	WIKE-----ELRQEEEDLWDSRLQCLADLTKWK	3054
SEA ANEMONE	KIYNEAMS--CD-D-----	WSS-----KPPQEEEDLWDDARMQCFANLAKWG	3005
SEACUCU	KLYDQAIS--Y-D-----	WEEG-----SLQQIEEDLWDEARLECCNQLTQWK	3026
LANCELET	ELYNQAMQ--ET-E-----	WPDG-----QPLAVEEDLWDSRLQCYDHLTQWK	3054
STARFISH	KLYNQAFE--M-D-----	WDEG-----AVSQVEEDLWDSRLNCCNQLTQWK	3068
SEA_URCHIN	ELYSKALS--S-D-----	WGPD-----GVAREEEDFWDEARLQCCNQLTQWK	3050

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	KLDAQKDV-TQL-----TDRELNANI---P---LIR-RT--FHKYMSI--	2935
TETRAHYMENA	DLANELTEI-NKD-----VLEQP-EKI--G---VEK-MKILMLSLMQSDS	3212
STYLNCHIA	ELAKMSEK-YHS-----KQ--L-SEI--P---FKH-A---EKMIRAQI	3148
APHANOMYCESa	TLLDDV-----HPDRLDQH--E-PFLKHTKCFLEASIAIQD	2760
APHANOMYCESa	KVLEEV-----ESLDDWQON--E-PFLANHMGYFLEASMLAND	2694
PYTHIUM	KLQKELGS-----TEDGALWNEE--P-PYLBQGVKHLSHSTLALIE	2947
PLASMOPARA	ALNSEITEA-----ANADTNYLKQR--P-PYLBQGVGHYLRSLGLLE	2926
BREMIA	TLEAEISIA-----TKKNSEFLKQR--P-PYLBQGVGHYLRSSLSLSK	2907
AEDES	DLVSIIE---RQ-----V--DGNMEEFVDE--WN--LENILPKYVHSNRLNL	2984
MIDGE	VITEEIR---NQ-----F--NS-YNDWDEK--FPFYKTELLPHLMKSELRMIL	2981
BOMBUS	EIDRHLKKG-L-----DRRLDNKMNMP--W---KWMFPWFVHVVRKLI	2831
ANT	ALDRLVKDR-AG-----NGDLANIENPT--W---RWLLPYACDAILYA--	2901
WHIPWORM	RMTALVPCY-DDAG---R--T-QYDEIKKDD--HS--IDPYLPLLRSKIKLMM	2951
TRICHINELLA	GLETWSTTF-SASG---K--TAKLNQINETD--YL--IMHLPVPLRSKIKIAL	2952
BEEBLE	DLINSVDSI-VSQN---P--TETWNNLDQG--FN--QEKLLPWYISGHKLDIL	2811
BARNACLE	RLSRVQDR-LTAD---HDQOPRLDSVLAGND-EQ--RDHLLPWLVSXQLAI	2879
THRIP	QMNDVIR---EE-----V--DNELDNLWNS--WY--EKLLPRLHSEVLGLV	2876
FLEA	DLNIGIK---RQ-----V--DSLDEMTEQ--WA--QEKLPPLITSEIHKAI	2889
WHITFLY	ELKQSVL---VA-----L--DSDYDRLEEDKKLWN--LENIAWFLSSELMHFI	2975
TICK	ELQREVDSR-LARS---A--GNKWRDLWGG--YS--EHYLPLVYKSRVKTAL	2924
TERMITE	GLNNQVR---RQ-----V--ENNLQDLWDE--WL--QEKLLPQLLSEIQMML	2976
DAPHNIA	EIGSLNPKK-----EPWNR--FRVRNALQNFVGPAAREL	2748
OSTREOCOCCUS	EIGEMLADV-RSGN-----FEADLWADCGIAGEASGSRFSTAFRVAIRQPL	2928
STENTOR	DIKWCLPEM-N-----GLKMKSPN-----RLAQ	2636
KLEBSORIDIUM	ELVDESLEQ-VTE---YDAHGRPMADATQKLADE---NRDPYLRFLVLSAKVPT	3159
CLUBMOSS	EIMEDALLQ-VKN---DE---TDEYDLEKLNHPK---LQDPYLGFLVKGALVPT	2863
MOSS	VLMGEIYE-SME---GD---NSEPDFKRLAEP---KQBIYLYGPIRGAVKEAK	3015
LIVERWORT	LLEDTLTQ-VRT---DD---SAEPDLQKLWEPN---LQDPYLGFLVGAALKST	3054
LIGNANO	RLSGVSKKLLTPA---DGEEGSGLADRLWSRVGQ--NVCKNALSSYMLSSTRLVC	3346
COPEPOD	AVQTAWSKQ-----FNNLDELWVNS--HKSVLQAFMSSSMHLSV	2890
GLOBOSUM	LLAASVLQD-V-----DDNLNSLWPE--NVPYKLPFLRSHLKLRE	2837
PALUSTRIS	ELAHYIMAD-L-----NNSTEHLWAD--YQDPDLRFFRAFRLRH	2912
NEOCALLIMASTIX	DLVDNVTDI-S-----NNNIESLWENN--KKD--LLANYIRGYIKLHQ	2993
GLOMUS	DLAFTVLVD-I-----EDNLSNLWDE--LQDIYLYQHFVHSFKLSL	3054
LOBOSPOR	YLEANMMSD-L-----DNDSQELWTEDE--YQDPYLYHYPLTYSYIKLVD	2997
SYNCEPHALASTRUM	DIAHQVKDT-V-----EGDYFLWVDE--KKDPYLRAFVHSFTRLRK	2978
FUNCTIVORUM	DLYDHWIE-VQR-----PQ--ELRREG---LADPYLYYVHSSEKSK	2956
HALBUM	NLKANFLAY-YPGG---PQ---SVEEQDE--NTRHEMMSHPLQYSIKVK-	3116
DPURPUREUM	ALKENFYSY-YND-----PI--SVKKN--CILLSYLFEFNLKVK-	3082
PVIOLACEUM	HLRDNFNAY-YPN-----PM--TIEDYN---ORBTLFHYFLQYHLKVK-	3093
AMPHIPOD	VLDSDLQRLTDP-----ESGAVDTERLWQLP--RPAAA-ITAFVNSRMKLL	3067
SHRIMP	ELENFVKRFLQD-----DDGEVDLNRVLLP--KPTATAPALVHSLKMLNII	3031
MUDCRAB	ELENFVENRLKD-----EAGQVSLNQVWVLP--RPAVSVLPSVNSKMLSIL	3024
TARDIGRADE	QLRATATIPLQMDQN-----SQSSEDMTALWENN--GHVETMLPYALRATFNLI	3058
HYDRA	NLKDFTLKS-IEQI---NDSDDDFCKMKWENN--ILQIYVLPYIRSNIKLMV	2927
SALPINGOECA	ELENNTLTC-INPDVEYEGTDLAEVIDANNVQVP---RLLRHLPHLITVRLLEGI	3077
SPIDER	NLESAAQSRFMD-----ESTSLLQWEDQ--YMKOYVLPYLVRSKLLKLL	3027
LIMULUS	ALEKAVCRFTDG-----QRPNLDRWEDS--YQEHYLPYVWRSKLLKLL	3081
SCORPION	LLQLSILNRLDENQ-----KQPNLNRWEP--YQEHYLPFLKSKLLKLLI	3046
ROTIFFER	AKCEWMMG-----NTLDQLWEDA--YSLEWVFPYAFRSKLLKLLI	2976
CLIONA	QVNAVCDAE-LNDYLE-----DTNCSLQVNRVP---EYERFLDTEVHSKLLLLI	3069
OCTOPUS	KVEKCVHG-IDPE-----NGDFTKVLDDS--FNQENYLOPLQSKLKLQ	2990
CAPITELLA	DVETLSTSD-LE-----GSLSAVWDS--YHQBAYLPPMLRSKIKLIL	3041
LIMPET	DLETVCLTA-IDNT-----ELPNLDKVEDT--LYQBHYLPYIIRSKLKL	3021
SCALLOP	ELDTVTSG-IE-----DGNLSSVWDDT--FYQBHYLPPIMRSKVKLVL	3083
LINGULA	ELGTEAMD-IEGL-----EETGLKINWEDA--YQEHYLPYIIRSKVKL	3048
OYSTER	ELEGVAMSG-IS-----SNSISQWVWDDT--YQEHYLPYIIRSKVKLML	3037
SNAIL	KLEMVTTDA-LSQE-----GEISLASVWDDT--YQEHYLPYIIRSKVKL	3051
SPONGE	DLEKASTCN-IGEE-----TNSKLEQLWEDS--YQEHYLPYVLSKIKLW	3073
PRIAPULA	ALDAHTKECLIPG-----SSEADLQLWEDT--YQEHYLPYVMSRKLKLL	3093
DANTO	SLEYCATVN-IDDS-----SPTRLDRWVET--FYQETYLQYVWRSKMLKQLQ	3064
ESHARK	ALEYCSTVN-IDDK-----TPADLENWSDT--FYQETYLPMIRSKVKLLQ	3072
BSHARK	SLEYCSTVN-ISDK-----TPVDLEDWSDT--FYQETYLPMIRSKVKLLQ	3063
XENOPUS	PLEYCSTVN-IDTG-----KPPDLNKNWSDP--FYQETYLPMIRSKVKL	3075
STERLET	SLQYCATVN-IDDS-----SPADLEKINWSDP--FYQETYLPMIRSKVKLLQ	3080
GAR	SLQYCATVN-IGDS-----SPVDLEKINWSDP--FYQETYLPMIRSKVKLQ	3077
HUMAN	SLEYCSTAS-IDSE-----NPPDLNKNWSDP--FYQETYLPMIRSKVKL	3053
PLATYPUS	SLEYCSTVN-IDSE-----SPPDLNKNWSDP--FYQETYLPMIRSKVKL	3061
TASDEVIL	SLEYCSTIN-VDSE-----NPPDLNKNWSDP--FYQETYLPMIRSKVKL	3065
COELACANTH	ALEYCSTVN-IDDK-----TPADLENWSDP--FYQETYLPMIRSKVKL	3071
CAECILIAN	PLEYCSTVN-IDDS-----KPADLNKNWSDP--FYQETYLPMIRSKVKL	3073
CANARY	SLEYCATVN-IDSG-----KPPDLNKNWSDP--FYQETYLPMIRSKVKL	3062
OSTRICH	SLEYCATVN-IDSG-----QPPDLNKNWSDP--FYQETYLPMIRSKVKL	3032
GECKO	SLEYCSTVN-IDDK-----QPPDLNKNWSDP--FYQETYLPMIRSKVKL	3072
TURTLE	SLEYCSTVN-IDSG-----QPPDLNKNWSDP--FYQETYLPMIRSKVKL	3071
ALLIGATOR	SLEYCSTIN-IDSE-----QPADLNKNWSDP--FYQETYLPMIRSKVKL	3029
APLYSIA	DLEKVSVRG-VDSS-----DEPNLDKVEDT--FYQEHYLPYVWRSKIKLVL	3099
TRICHOPLAX	KLEYLSLVN-VDNN-----DPPSFDKINWEDN--YQENYLPFLKSKAKVMC	3045
SOFTCORAL	KMDHNCIVN-FDEA-----NGVLDLNQINRDD--YQEHYLPFLKSKAKKFC	3071
STONYCORAL	ELEKCSVES-IDDK-----NPPDLNKNWSDT--FYQEHYLPFLKSKAKKFC	3098
SEA ANEMONE	DLEEYSKTG-VDDE-----GNPPDLNKNWSDT--YQEHYLPFLKSKAKKFC	3050
SEACUCIE	ELENYATMN-IDDS-----EQQDISKVDGG--YSQDLYLPMIRSKIKLQ	3070
LANCELET	NLYEVSTVN-IDED-----SPPDLNKNWDDT--YQEHYLPFLKSKIKL	3098
STARFISH	ELQNYSTVN-IDDN-----SPHDLGKINWSDT--FYQEHYLPFLKSKIKL	3112
SEA_URCHIN	DMEFSFTDQ-IEGK-----GSNDLSQINWDD--YQEHYLPYVWRSKIKL	3094

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	N-----KTGEFD--LQKAKYL-----ERRTEHLADEFL--EKTLLI--I	2969
TETRAHYMENA	A-----DTSRWELKDYVKLWM-----NT-EYGKSVLEGPLSY--EMALIT--I	3251
STYLONCCHIA	R-----TDEYWNNTKQIAFWQ--KD-QVSKAYLDKNFNY--ELAINS--L	3187
APHANOMYCEsa	TSL-----LREFDIPLOPTRQQ-DTKLQYLVTFRPD--LIACAN--M	2798
APHANOMYCEse	NDR-----LKSFFGSIN--NQ-SDKQRYLNSRFPD--LIAAIY--L	2728
PYTHIUM	GPADPE--GEDESEMISVLRFLDDAH--KE-PKRWDLLQTNFGV--ELSS--L	2993
PLASMOPARA	ASP-----SNDLLESIQNFIGDAV--RD-SAKVKLIQSKFSV--ETCLAY--L	2967
BREMIA	ANQ-----PDSILASLRNFIGSS--RD-LRKAELVQSKFV--ETCLVH--L	2948
AEDES	AGD-----ERGRFIALLETWM--RV-PDRMDYKSNFG--EIAMLQ--I	3023
MIDGE	NND-----QVDVDFMKLLEEWI--ND-DVKCKYIKENFPE--EIMLH--I	3021
BOMBUS	NEDN-----TEEPQDFKIMESWL--ND-TTKIKHKRPFGE--ECSIF--F	2871
ANT	SEEK-----NWDNNDLLEVIQSWI--YD-RDKLQTLMPVGE--ELVIF--L	2941
WHIPWORM	TS-----APQEEFISFVERGE--AD-EANRQILLSRHAG--ELALLN--I	2989
TRICHINELLA	TSD-----SAALEELSAFVQEQ--TV-PKNREILNRRHS--LVLN--I	2992
BEEBLE	FT-----DSSTQHFLSLNSSL--ES-SHL-AHLETHVLE--EITMLW--I	2849
BARNACLE	ERD-----GTTTQQLHQLFDAGL--AE-EASRHLESRFP--ELALRH--V	2919
THRIP	QR-----NEDSKQFLNVINRWL--KD-DAKSTLSRSE--ELSIIC--L	2915
FLEA	NS-----SENSEFPFLSSWL--SD-SEKAAYLKTNFSE--ELSIIN--I	2927
WHITEFLY	-----RSGNSEFPKINQWI--HD-KDKERRKENELNLYVGE--ELAVWNAI	3017
TICK	EL-----GGEDQFLELRQWL--ED-PARKRLLEACVVE--ELVLLF--L	2963
TERMITTE	DKGV-----DSKREQFLQVDRWL--RD-RDKSDVLSSEHCE--ELAAIF--L	3017
DAPHNIA	D-----NPLPFPVQVLA--NPLPFPVQVLA--EIAMLQ--I	2769
OSTREOCOCCUS	V-----DW-----SAFFANIF--AN-GESALRHRSVQV--ELSH--L	2961
STENTOR	F-----SOLIEVC--KLPNSLSLRPY--EMLLN--L	2665
KLEBSORMIDIUM	Q-----HVALQEFLEASM--DD-PAKRARLTDQGL--ELTAMA--L	3194
CLUBMOSS	H-----QSLTKFLQTSL--VD-STRRDVLLQRFGT--QVAA--V	2898
MOSS	Y-----HGLUTEFVQSS--EI-LPKRQFLNEFST--ELALTA--A	3050
LIVERWORT	Y-----GSLADEFVQSSF--KE-PLKREVLKKNVGT--ELALTA--V	3089
LIGNANO	DKPE--SALGSDSESAEFMLRCTT--DN-DSVRTQFESHA--ELAVL--I	3392
COPEPOD	T-----KDSNVLGYNFLNNSL--TD-KTKSSVLSGTCAL--ELAVLF--G	2928
GLOBOSUM	GRTLADDTFVWSPADDNP IKKFLDEAK--KD-AKRSVLELLSD--DLTSA--V	2887
PALUSTRIS	GFQMDAGIHIEWKEDRPNPLDYFISKAM--ED-AAKRSVLSGSLSK--DLSLAL--V	2962
NEOCALLIMASTIX	GYDREKNYHEWDDNKNPVQLLEDAL--KD-MNKRDLVNTNPPY--ELSVLS--M	3043
GLOMUS	SDD-----NSEYRQRFDFIDGAM--AN-QYKSLITTYQPI--ELALBS--V	3095
LOBOSPOR	GRRE--SEMLEPFWTANPNPFPQIDEAM--NN-PSHRQILPTQOP--ELALAA--V	3046
SYNCEPHALASTRUM	GIMIDQSNRADWTDNPNPVIYVMSDAF--QS-KDKKEYLQNHAC--DVALVT--M	3028
FUNGIVORUM	-----NRWEQLWQFISTSF--ED-KTKRGILESEELK--EMAFVA--V	2992
HALBUM	-----ENWPDLQFMGSLT--P--SOHQYMESSFPG--ELAFLE--I	3150
DPURPUREUM	-----ENWNQLYQFIGKLE--P--HQYQYLEDKPSG--ELAFLE--V	3116
PVIOLACEUM	-----ENWPSLYQFISSLN--L--EQYQFLETKFPG--ELAFLE--I	3127
AMPHIPOD	S-----N-AESDGGLLQFVNNAM--KD-EPRKMLLEDNVSL--ELGVLS--V	3106
SHRIMP	D-----G-SETDNLIAPIDQSM--GD-HRRRSMLEGLDPL--ELGVLA--A	3070
MUDCRAB	D-----G-SETDRNLNAPIDSAL--GE-PNHRNLESTLPL--PLAIMS--A	3063
TARIGRADE	ENSAA--Q-EKAGDALDAFIDKAM--EI-SGRDRFLQRKGF--ELFIYQ--L	3101
HYDRA	EEKY-----DLVHKEFQSFIDSSL--SD-EYSKCOLQMRCE--DLALLK--I	2968
SALPINGOBECA	S-----AVVACCLQAFVEAAR--PH-DORWALQHFRAM--ELAMLS--V	3115
SPIDER	N-----GKSQPSLNFPEESR--KD-DENKTLEHNE--ELALLY--V	3065
LIMULUS	E-----ERQDQSLSPFFNSM--QD-PDKKEYIEETHTE--ELALLY--V	3119
SCORPION	E-----NRNDQSLCLPIDSAL--KE-ENKKEYIEENFSE--ELALLY--I	3084
ROTIFER	QEDEN-----E-QKKHKDLIRFINGLE--VEKKYLEBOSFCQ--EMALIS--L	3017
CIONA	QGNI-----EAGNELCEFFDDSM--QGDDARKNMVEKNVSE--ELAMMY--I	3110
OCTOPUS	Q-----QDINQTEFLKPIDNAL--KS-PFKSNILEHOFK--ELSLMF--L	3029
CAPITELLA	N-----G-DTSQDNLLSFIEESL--KT-PVHKAFIEGFS--ELALVC--I	3080
LIMPET	L-----G-GDQDQSLTFVDTSM--KT-TEYRAVLESRYSM--ELSLMY--L	3059
SCALLOP	Q-----G-DHHQDLSLTFVDEAM--KI-PEHKSILNRCG--DTALLA--V	3122
LINGULA	Q-----G-NEDQDMLDFVDSM--NV-EEQKIFLEARYSE--ELALLY--L	3087
OYSTER	Q-----G-DGDQDPLTFIDDCM--KQ-TEQKALIESRSE--ELALMY--I	3076
SNAIL	H-----G-DEKQDLSLTFIDDSM--KN-PQRAHLESRC--ELALMY--V	3090
SPONGE	T-----DSDHGLASFLDKSL--SE-EANRVSLEHQP--ELTLY--V	3111
PRIAPULA	V-----EGARDQTLSPVDAAT--GH-PDRRAVLETWGE--ELALLY--I	3132
DANTO	M-----GETNQDLSLSPVDAAM--KT-EHKKIIMETHYSO--ELSLLY--I	3102
ESHARK	S-----GEVDQSLTFVDRAM--KV-EQRKAVIETYSO--ELSLLY--I	3110
BHARK	L-----GENDQSLTFVDNAM--KV-DQRKVIETYSO--ELSLLY--I	3101
XENOPUS	G-----GNNQDTLTFVDEAM--KV-EQRKVIETYSO--ELSLLY--I	3113
STERLET	L-----GEPDQSLTFVDNAM--KV-EERKSIETYSO--ELSLLY--I	3118
GAR	L-----GGDQDLSLTFVDNAM--KV-EERKSVMETNSO--ELSLLY--I	3115
HUMAN	Q-----GEADQSLTFIDKAM--HG-ELQKALELHYSO--ELSLLY--L	3091
PLATYPUS	Q-----GGSDQSLTFMDEAM--KK-EQKTLIETHYSO--ELSLLY--I	3099
TASDEVIL	Q-----GASDQSLTFIDEAM--KK-EQKTLIEVHYSO--ELSLLY--I	3103
COELACANTH	L-----GGDQDLSLTFIDNAM--KV-EERKALIEHYSO--ELSLLY--I	3109
CAECILIAN	Q-----GKDQDLSLTFIDNAM--KV-EQRKALIEHYSO--ELSLLY--I	3111
CANARY	S-----GENQDTLTFIDEAM--KT-EQRKALIEHYSO--ELSLLY--I	3100
OSTRICH	N-----GENQDTLTFIDEAM--KT-EQRKALIEHYSO--ELSLLY--I	3070
GECKO	H-----GGDQDLSLTFIDEAM--KT-EQRKALIEHYSO--ELSLLY--I	3110
TURTLE	H-----GNDQDLSLTFIDEAM--KI-EQRKALIEHYSO--ELSLLY--I	3109
ALLIGATOR	H-----GGSDQSLTFIDEAM--KI-EQRKALIEHYSO--ELSLLY--I	3067
APLYSIA	A-----G-EGNQDPLTFMDRAL--SD-EGKKQYIQSRVCE--ELALLY--L	3138
TRICHOPLAX	ENDLA-----SDDFIQYLNKSL--AN-DEHLSVLENHCD--CLALIH--V	3085
SOFTCORAL	I-----GDRDEVFNFIKFDL--KN-EERKVLLENKYS--ELALLF--I	3109
STONYCORAL	Q-----GSGDMTLEFVAKAM--KT-SERAAALRSVSD--ELALMY--V	3136
SEA_ANEMONE	E-----GEERPCLFLRHSM--MN-EERKALIESRVD--DTALLF--I	3088
SEACUCUR	SSLIE-----GADTADSLQFVDSM--QQ-QDRRNILEVRHSE--DTVLF--V	3114
LANCELET	E-----GEMDQSLTFVDSAM--QK-PDRKALIESRCE--ELAMLY--L	3136
STARFISH	E-----GSEDTLQFDASAM--SD-ADKRALEARYSE--ELTLY--V	3150
SEA_URCHIN	E-----GSEDDSLGFLIDSSA--KD-QEKRVLIESRTE--ELALIS--I	3132

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	GVE-----	-----IDIDKKM LI NTAVRSP----	SL	3051
TETRAHYMENA	KIE-----	-----ATYEDFN SLFKM QNRKP----	SN	3329
STYLONCCHIA	QEGLOTK-S-	-----DIVPQVI KLHK WMARVP----	SY	3270
APHANOMYCEsa	THGG-----	-----GAMSP CVEK WKPIVP----	LV	2871
APHANOMYCEse	N-A-----	-----SSIES CLL KKSITP----	LV	2799
PYTHIUM	KSVV TE -S-	-----TTAMDSRYI SF VEGSRALP----	SQ	3078
PLASMOPARA	EDGSD--I-	-----C--K NE NHF GF VNE W KQKFP----	FT	3048
BREMIA	RDT FE --M	-----R KT LQ DF VG FK W ER FSP----	SM	3031
AEDES	LLSRMK-----	-----E--D QL K LF W SS SFP----	TA	3100
MIDGE	STDVSMI-----	-----E--K VQ L HS RTSKP----	IP	3099
BOMBUS	SAESSTD-----	-----L--N EL K P W NS MP----	SS	2948
ANT	CTKKT VD -----	-----LN K TV S KAL FN PS M KTP----	TI	3023
WHIPWORM	ASGEA-T	-----I--PRIGAL CT L W ANS G -----	DL	3067
TRICHINELLA	ASEHL-K	-----L--E S V V R L CR F W L RY L -----	DV	3071
BEETLE	NNISIE N -----	-----V--VEID G L V W N RAAF----	EN	2928
BARNACLE	--TAPDP-----	-----T--AAAS SL LD H W E RNY P ----	AA	2996
THRIP	EGKELQS-----	-----V--E ES R N V L K K E V LP----	VP	2992
FLEA	KSDKIEY-----	-----A--AT V R K L I K K LN N MA-----	KP	3007
WHITEFLY	DSFAL TQ -----	-----M--TK M ER L L K W N K H SP----	AI	3096
TICK	HHT R GR T -----	-----E--DD V DR L L S K R L R V P ----	SN	3040
TERMITE	NGEHS KQ -----	-----E--LL A K L V K R N K R V P ----	SA	3097
DAPHNIA	LI FN AS-----	-----L--H-----	PQ	2833
OSTREOCOCCUS	EINDIL C -L	-----SS--TGSNI--D--RANT I V S DI SI IRSR W P----	SA	3052
STENTOR	PKDEEE-Q	-----E--HK Q N L I S I L NS I K T R T P----	SI	2748
KLEBSORMIDIUM	SSSGD QA AVTART G PL P SS S GR S L P GG L LN P DN K D P L R Q V GD L DT Q HR W P----	SW	3304	
CLUBMOSS	RPDRS-----	-----N I S R L L S K W R Q R W P ----	ST	2974
MOSS	KPEAG-----	-----E L S R L L S G W H K R W P ----	SP	3126
LIVERWORT	NQQSE-----	-----Q L P R K L V E W H R W P----	SS	3165
LIGNANO	GDRR RQD -----	-----V V S T AD L L A K W R Q R R P----	DF	3473
COPEPOD	LS-----	-----N P N K I L L K W E Q N AP----	VS	3001
GLOBOSUM	LPGLA--S-	-----TK D E Q L C S L F A G W H R Y P ----	S-	2967
PALUSTRIS	D--H--K	-----SR S LR F EAL I K Q W A R Y P S ----	I-	3039
NEOCALLIMASTIX	NINS DH SK-----	-----Y I F N K M I S K W D T R Y P----	SN	3123
GLOMUS	SSEK DQ -----	-----I W D S H L S H E R R F P----	SK	3172
LOBOSPOR	KALR DP MA-----	-----S F L A S L S K W D H R F P ----	SV	3126
SYNCEPHALASTRUM	EYQR N KAL-----	-----S T A D R V T N Y I K M Q A R Y P----	DP	3112
FUNGIVORUM	R--EAH-L	-----E N T A L N T L M D G L Q R Y P ----	SS	3072
HALBUM	---NDKR-A	-----I E V D K M E L V S L K T R Y P ----	SS	3230
DPURPUREUM	---SNQ-N	-----I S N N Q L D H L S Q W K R F P ----	SK	3194
PVIOLACEUM	FSINS DV -T	-----I N T N Q L N S L L K W K H R Y P----	SL	3210
AMPHIPOD	ENSEAG-K	-----K--AL A S K L C S S W L H N L P ----	RK	3186
SHRIMP	YAD R D F --Y	-----S--SK V K O V T S W K K Q K -----	RI	3150
MUDCRAB	YTHNEN--Y	-----P--N K V R K V K N K T Q E -----	CL	3143
TARDIGRADE	QIAH-----	-----S P Q K G R E L E Q W H F L A N S E R E A Y ----	3185	
HYDRA	SDNY--K-D	-----TA--KV Q E F F S Y S N R L P ----	DP	3047
SALPINGOBECA	QETN-LA-S	-----E T --S V N L L S S S K R T P ----	TP	3195
SPIDER	RNNS-YQ-Y	-----K S --A L K L K Y Q K R L P----	NA	3144
LIMULUS	EENN-FN-S	-----E R --P A K S L L K W E L R L P----	SV	3199
SCORPION	TYRN-ID-----	-----E Y --H F K N L D R L K R Y P ----	DI	3163
ROTIFER	SNQA-FT-V	-----N L A K K I D N L D V T D S M P ----	NM	3099
CIONA	GENE-IS-S	-----Q S V K N L V S C S N S L P ----	NT	3189
OCTOPUS	NKEK- IK -S	-----C S S I N R L F N C W E K O T P ----	SL	3109
CAPITELLA	TTSG-ED-F	-----P R --Q I D R L L H K W E A R S P ----	DR	3160
LIMPET	NEND-IT-H	-----T--TAN Q L L K S W Q R O P----	HK	3138
SCALLOP	RESN-FS-S	-----P G --P G N R L L E K W E R R S P ----	DM	3202
LINGULA	NEDT-FQ-D	-----S Q --A A L S L V T R W Q T R S P ----	DP	3167
OYSTER	SEGN-FT-S	-----V T --P A N S L T E R W A R A L-----	HP	3156
SNAIL	DKNN-FT-S	-----F E --P S H Q L A R E Q R Y P ----	HV	3170
SPONGE	ENDN-FS-S	-----P G --P V N L L K W K R F P----	DP	3193
PRIAPULA	ATPDA F T-R	-----N--D T A R A L D R A N D H M P ----	HP	3213
DANTIO	GD---V-S	-----V N --S L K F M I R R T S H Y P----	DA	3179
ESHARK	KEYN-FI-S	-----E V --P L R K L L R T W G R Y P----	DA	3190
BSHARK	KGSN-LT-S	-----E V --P L R K L V R T W G R Y P----	ES	3181
XENOPUS	KPGN-VS-S	-----S--S L R K L F Q G W K R Y P----	DS	3192
STERLET	KD---V-S	-----Q T --S L K S L I R I W T D R Y P ----	DA	3195
GAR	KD---V-S	-----T A --S L K T L I R T W T H R Y P ----	DD	3192
HUMAN	KQGN-LS-S	-----Q V --P L K R L L N T W T N R Y P ----	DA	3171
PLATYPUS	RPSN-LS-S	-----Q A --S L K R L L R I W T N R Y P ----	DA	3179
TASDEVIL	KQGN-LS-S	-----Q A --P L K R L L R I W T N R Y P ----	DA	3183
COELACANTH	KPDH-LM-S	-----R A --S L R L L L R N W S D R Y P ----	DA	3189
CACILLIAN	KPSN-LT-S	-----Q T --S L K R L L R I W S S R Y P ----	DS	3191
CANARY	KREN-LA-S	-----E A --S L K R L L R I W T S R Y P ----	DA	3180
OSTRICH	KTSN-LA-S	-----Q A --S L K R L L R I W T S R Y P ----	DA	3150
GECKO	RSGN-IA-S	-----Q A --S L K R L L S I D W S R Y P ----	DS	3190
TURTLE	KPSS-LA-S	-----Q V --S L K R L L R I W S R Y P----	DD	3189
ALLIGATOR	EPSN-LA-S	-----Q A --S L K R L L R I W S R Y P----	DA	3147
APLYSIA	IDGG-GG-----	-----V S P S G V R V L V D K W Q H R W P ----	HS	3219
TRICHOPLAX	DGRN-FE-S	-----V T --P V L S L S L S K W T R F P ----	NE	3165
SOFTCORAL	HEDN-FS-T	-----I S --S V K S L L K R W S S R E P ----	DP	3189
STONYCORAL	EEGN-FS-----	-----S P M P V L S L L N K W S R L P ----	HP	3216
SEA_ANEMONE	KEGK-LL-----	-----K K T L E D L F S R W S V R F P ----	NS	3167
SEACUCLE	KSDV-TQ-S	-----E G C R K S R O M L E R W S S C L P ----	DP	3196
LANCELET	NDRN-F-----	-----E T P W P V T R L L E K W S S R Y P ----	DN	3216
STARFISH	KPDL-QE-A	-----I G C Q K S L E L D R W S C H E ----	DS	3232
SEA_URCHIN	KPFS-EG-L	-----K S --S A T R L W S D W S R N L P ----	DP	3212

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	Q-D-SLYTNRRIYQNRILIMANQ-----THP-----	3074
TETRAHYMENA	TYD-NQICDQILNSREIFALALYQKYNLEDFVFNK-----	3364
STYLONCCHIA	AFD-TIVVDIILTARNLYIDL--YKFLRKDEFPTS-----	3303
APHANOMYCESe	HQD-SLDAWSTYHLIRNVGYESLVAATDESKYG-----	2903
APHANOMYCESe	QAD-TLTKTSSYLLIRNLYGVDLTAHSGGQAGK-----	2831
PYTHIUM	GEH-SMALSHFYLQVQVRSFLLHSGSEGLI-----	3110
FLASMOPARA	GEH-GMVLSSHFMVQNAITSLMLNRAHQDQVGL-----	3080
BREMIA	SEB-GLELSSHMMQNTIVDPFLKTASDQGM-----	3063
AEDES	-SD-SPTVVDLILVYRKFVLANKELETLLESADD-----RL	3133
MIDGE	-SD-SLVLHDLIAYRRNPHRILEENYKFGNV-----TE	3132
BOMBUS	-LD-AILPDKLSYRYTFINKLLDDKLEWNESLI-----QNSD-----DSNPDE	2992
ANT	-RD-NLIQNKLAAYRAYSSMLFYDSCQK-----	3050
WHIPWORM	-TNYTPVVDLVCNRRNLFIEQADDLAGGK-TA-----	3098
TRICHINELLA	-EHLTTTADQVILNRRKTFLEMPFGKLVDS-GI-----	3102
BEETLE	-LP-SILLKEORVLYRKQFLRTLVRKIESFDND-----	2959
BARNACLE	-QE-SLAFVRLVGRRHLYVDLPPGTR-----	3022
THRIP	-QD-SLMSVETRLTYRFACMKYMPTEMEK-----	3019
FLEA	-SD-SLLIVESKLYRMLFMSNHKKQLATL-PQ-----	3037
WHITEFLY	-SD-SLTHDRLLYRCLFLAQVVKELGND-LE-----	3126
TICK	-AD-SVLLSDVLSNRCLVKSLSGQ---S-----	3064
TERMITTE	-FSLRLRDLAMTRKKTNRIDQMLEMT-----	3125
DAPHNIA	TGD-SLIVDDELALRFTFAQRKKTERRLA-----	2862
OSTREOCOCCLUS	VHD-PSEA-RVWVFRSRMMSTIVGVPIEITTT-----	3084
STENTOR	ALD-DINTVFRILFARLLFYDTINQINLNVEEL-----	2781
KLEBSORMIDIUM	EHD-RVGVGDVVVRRHALCLERAKGHMMLAQAGHV-----ANY	3342
CLUBMOSS	ERD-DVVAVDLQNRLLVFLQKQLFNTTPEAK-----ADQ	3010
MOSS	NFD-DVEADVIAQNRLLFLKYIQEHFNNPVRNS-----FDDK	3164
LIVERWORT	KLD-SVEADVIVKNRLLVFFHKIQGLVNRQVSTGSVL--LGATD-----TRDK	3210
LIGNANO	IRD-ACDSVRLVAVRLLCANKMLLDVGLDDLA-----	3505
COPEPOD	-SM-DLANEDLITRCLYNEKREKMEDEDSN-----	3032
GLOBOSUM	ATD-SISVDVIVSGRKLMIKSVSAMLNNPQDQNN-----	3002
PALUSTRIS	DLD-SIEVDLIMLTREVTAEKWAEVGFSPEEKS-----	3072
NEOCALLIMASTIX	NEI-SIDYVFDICENRETFLAQIKKAIENDSNINMN-----	3158
GLOMUS	TLD-SRPTDQIVTRQSLKEBMAERKLMFRN-----	3205
LOBOSPOR	STD-TMVTNSVLDDRKLMIQRLDYTAYSRQEQ-----	3159
SYNCEPHALASTRUM	KRD-GDVPDDIILKSRNMPFEEELKGVIDQKDLPN-----	3145
FUNGIVORUM	EVD-PLTVVDRIVTNRGIYMEKIHQSQSSTVRG-----QNE-----INEH	3111
HALBUM	-FD-DILVDDLVFRSFLLEKIYERFIQONNN-----DEA	3264
DPURPUREUM	-QD-DIMVDLIVFYRSVLEKIYERFSTFCTDK-----S	3227
PVIOLACEUM	-MD-DIEVDIVFRSFLLEKIYERFSTFANIES-----KNQ-----DQES	3251
AMPHIPOD	-ED-DAVFAFLASVYRGIYLFHFMKMGCRE-----	3214
SHRIMP	-DD-NPLMTCGLASVYRDLVYHLMKELPEDS-----	3179
MUDCRAB	-TD-SVLMQFLSHRELYFQFLKELPQDC-----	3172
TARDIGRADE	AND-PVGVGSDLATTLCRCYSHVLSAQPKNR-----	3214
HYDRA	KKH-SHLAHDVLSRCAPIKKFKSVYLSDRYACQL-----	3082
SALPINGOBECA	YKH-PLHVDEVLFRRVIFSKLIHGCFRFGAKA--AEMLQQVDLTD---SRA---P	3245
SPIDER	-LD-IPVDLQVLANRQLYIQKLDKFNQVEKMEVS-LSDSLNDSSI-----HED	3192
LIMULUS	-AD-PLHVDDIVTNRIMPMEKIREKVVGSVPQDSA-ADSSMKT---L-----SQE	3245
SCORPION	-FD-SVNIDDIIMNRSLYMEKIVSKLQETNNQSTSPLESMDTIVDS-----EPN	3214
ROTIFFER	QTD-PPCTDQVITNRSIFFEFIEEKYLSNSVC-LTD--PETSTTFLGDSVMNDFEDLSN	3155
CIONA	NFG-SITANDCIVYRSFFMDQLQKLLNIES-----DSMLH-----	3224
COTOPIUS	LED-PVKVDQVITNRLTYIDQITIERNKPE-----YSDAMDTN-----	3147
CAPITELLA	LLD-SVNIDDIILNRRVYMDHFAEHLTSDID-----	3190
LIMPET	LLD-PVNIDDQVTSQRNVYLDHISQCLAGKN-----KESQEM-----	3174
SCALLOP	LLD-SVRVDQVITNRRVFLDHIGARLMAR-E-QN-SEDSMEV-----	3241
LINGULA	IVE-PCNIDDIVTNRCLYVDQLCHKLSSVQE-E-----F-----	3200
OYSTER	LLD-TEAVDHWVTRNRVFLDHSNRLSTSLV-KK-EEDAMEE-----	3196
SNAIL	QLD-LVDIDQVVTNRNVYMDKIRQMLSSNL-ME-E-----D-----	3205
SPONGE	KLD-IPVPIDDIITTRMMMLAKISITKLDQSVL-SQQ-C-----EYLLDDDG	3236
PRIAPIULA	TLD-PVSIDDIIVNRCLYMDHLSRHPHGNQP-----	3244
DANIO	KLD-PMNVDDIITSRCPFLLDKILKRLKST-----PENSMEVDGADQG-----	3221
ESHARK	KMD-PMSIDQVITNRCFFLDKIQERLVSV-----Q-ADSMEDVDREGEV-ETRMEDVK	3241
BSHARK	KLD-PMSVDQVITNRCFFLDKIKERLSLL-----Q-ADSMEDVDDEGA-ETQMDIDK	3231
XENOPUS	KMD-PMNIDDIISNRCPFLLDKIQDVAVGHQP---L-VDESMEDVDLADG-NEAMEVDR	3245
STERLET	KMD-PMNVDDIITTRCFFLDKIAGKLTNS---E-ADNSMEVDGGEDT-GVKMEVDE	3246
GAR	RMD-PMNVDDQVITNRCFFLDKISEKLVSS---V-AGDSMEVEEDGDK-EIKTEAGE	3243
HUMAN	KMD-PMNIDDIITNRCFFLSKIEEKLTP-----P-EDNSMNVQDGDG-SDRMEVQE	3222
PLATYPIUS	KMD-PMNIDDIITNRCFFLSKIQEKLGL-----Q-ADSMEMDGGGDT-TDRMELEK	3230
TASDEVIL	KMD-PMNIDDIITNRCFFLNKIQEKLNCL-----Q-LDMSMEVBDGDF-IDKVEVEK	3234
COELACANTH	KMD-PVNIDDIITNRCFFLDKIQEHLKIV-----P-ADSMEDVDGEGDA-SPRMVDVE	3240
CARACILLIAN	KMD-PMNVDDIITNRCFFLDKIREKLPHF-----Q-ADSMEDVDGGDA-SDRMELGG	3242
CANARY	KMD-PMNIDDIITNRCFFLDKIQEKLSPD-----Q-ANDSMEDVEYA-GDMVEVDQ	3231
OSTRICH	KMD-PMNIDDIITNRCFFLDKIQEKLPRD-----Q-ANDSMEDVEKDDI-GDMVEADQ	3201
GECKO	KMD-PMNIDDIITNRCFFLNKIQERLPTN---H-LEDSMEVDGGDA-NDNIEGGN	3241
TURTLE	KMD-PMNIDDIITNRCFFLDKIQEKLPTN---Q-ADSMEDVDGRGDV-GDKMETDM	3240
ALLIGATOR	KMD-PMNIDDIITNRCFFLDKIQEKLNV---Q-ADSMEDVEAGDI-GDEMEVDQ	3198
APLYSIA	LLD-PATIDQVIVNRTVYLTQMSERLRKQGE-EEN-S-----EEP-TW-----	3259
TRICHOPLEX	VID-PINVDQVIVNRCMYLRKILLQYRVIQTAFTS--TEDSMEIDGEDRV-IY-----	3215
SOFTCORAL	KLH-SVGVDEQVMTNRSVFLDKILLKFGQSSQ-LHS-SEDSMEIDGLN-----	3234
TONYCORAL	ILH-PIGVDDIVTNRVLFMSKFLQKFEAMGA-EER-SGI-----C-----	3254
SEA_ANEMONE	KLH-PISVDDQVITNRRIFGLTVCVYRDP--S-MDV-DGEWSCP---S-----	3207
SEACURIE	KKD-SVTVDQVITNRCFLMEKFAFRFDVADT-QGS-DSE-----V-----	3234
LANCELET	RMD-PISVDDIILANRCYLDKLNKFEQMAA-RGV-LD-TEV---G-----	3256
STARFISH	KKD-PIINIDDVSNRLLTMDKLSRIRISEG-QA-GE-----E-----	3249
SEA_URCHIN	KKD-PIISVDQVIVNRCYCLYMDKLCNLLGDSGG-GGG--GGDSMET---E-----	3254

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	--VLGMW-----ALQPAKGVVQMNYPQAAANL	SICFKIYK-----	3108
TETRAHYMENA	--IRSNW-----YIQNVKGLMKKGIHGAADRKM	KKAAGYRVMN-----	3401
STYLONCCHIA	--LKQKHLDAI--GAILQVQCAKGSYKMGFLDSSDRF	LKRALKIRADE-----	3349
APHANOMYCEsa	--GRSIAQDMASI--RVHTMLSYAEAAVASNVLALAGRL	LADYRTLNCQAN-----	2950
APHANOMYCEse	--DDSIREVMAA--RVHAMLSYAEAAVESNVLALAGRL	LTYERTLCDENS-----	2878
PYTHIUM	--SDTVERVFNQE--HAQLMLKYAQAAVANDLLAVASKY	LKDYRELCNAEN-----	3157
PLASMODIUM	--SNETRLVVLGI--KGHALLQYANAAVSCNLSLASKV	LKIYRELCNTHQ-----	3127
BREMLIA	--SDEIQLSLRNG--MSNTLLQYASAAICNIPALASRM	LKSYRELCNTHQ-----	3110
AEDES	HQIDVFVQLTDA--VFETELRLDASVQSNQYFARKI	LKRLDVAEQQS-----	3181
MIDGE	DSFDYLLNLQ-----RNIENVAFAQKNCDAAPFI	LNGLKDEIRKKS-----SN-	3175
BOMBUS	NENSITRYRLRTI--IFDMRLKMVEASINQKNKYIAKNYL	LQVQSVSEAPS-----IF-	3042
ANT	--QTKRRLFQI--NYQLRLDIVDAALNQQRVYIAERHL	LNQVQVTCVEE-----	3095
WHIPWORM	MAKEIYPSLAHF--SVRYRFQYAKNALHRMNYDTALRQ	MEARKISIDDD-----LLL	3149
TRICHIANELLA	SVSDVRSGLPFF--RLQFGYQYKCAVRQNNHGVLLQR	L-----QDK-----HLL	3145
BEETLE	DFANTLTQLNDM--SLKLDDEILEAAIGENNFMTKKY	LNLNRRNNAFKT-----	3007
BARNACLE	-----QORY--LRRSRLRLVEAALQQRNATAAGRO	LGHLSRQOWDAD-----	3062
THRIP	-----EVEKS--ALRMQLSLAEALQGNQNFQAKY	LVDKMGKIQSS-----	3060
FLEA	DFAPINEELDNC--KIKMELSFDAAIKQKLNGLSRIY	LTKLKDGLGHED-----	3085
WHITFLY	-----TGCKS--LKDSRHLHIDITLKGNSSEFAKQO	LRLVQKHIPESV-----	3168
TICK	-----GAGKA--A--RLNLNAPAGAMLQRDNIPTALRC	VLE--IEKMTREG-----	3103
TERMITTE	-----GASNA--LSRTFLAMVDALYQENFIYARKY	LREAREKMSNSG-----TD	3168
DAPHNIA	-----S-----VKSLRLKLTALTALEQNTETARKL	LEGAOTDLRHEM-----	2897
OSTREOCOCCUS	-----SIEAL--RTGMWLCASDGLRQVQVALSRKFL	LQYIESVQRT-----	3124
STENTOR	-----NDY--ASSLYIGTAEALKHGWLVDSEKLL	KDANIKRKRDKT-----	2820
KLEBSORMIDIUM	DGTKLAADLAAS--SSSYFKQAAAGLRKGEYVDAQDY	LKXYDAGROS-----LGNV	3392
CLUBMOSS	ARQNFTRKQLEE--RAFQFLQASRGVMKQAYCVAQY	MDYVAVAE-----KT-	3057
MOSS	FCNSISSLDAE--RAHLHVAVANGLMECCALPVAQSY	LNRYMSSKF-----EFS	3212
LIVERWORT	KSEALASKLDQE--RAHIFHQAAVGLRKGAYNAAQSY	MEHMAHQ-----GTV	3258
LIGNANO	--AGKRRFNAP--AGEQLLLLAEAACLQSQPAVALIHL	LGRARKYCTQTS-----ATSTR	3555
COPEPOD	--LYEKALGRG-----YANLALSAVYQNALFAQRCL	LKXKPLMDGVD-----	3073
GLOBOSUM	--VYKHFQVIVSDLLY--SRMKAATAAQGLFSAVADR	LDTANSRPG-----G	3046
PALUSTRIS	-----IVNSNLQDTRRIMAKAARKHQRFYMAERY	LTVSQVONG-----	3109
NEOCALIMASTIX	--DYNNKLEH--KKNIWLTCSKAALMKNFVAVATC	LRSKNYGLS-----	3202
GLOMUS	-----MKV--SL--ESQQLKMSFTARKQNFVAVCTE	LKIKRMLLI-----	3244
LOBOSPOR	--TLVTN--H--RIRSPMKMSAARQGNFYVANTC	NASMQKQAS-----	3199
SYNCEPHALASTRUM	-----PVMLAMDCE--SKSNILAEISAARQNNFL	PLAYNTI--SFSSELEV	3188
FUNGIWORUM	KLSELKELLDK--RSKVYREIADAARKQNNLYSEAY	LRNALKSXSK-----K	3158
HALBUM	KEDGVKNLIRE--RAELYHQMSKARKLGNIVSEAY	FRLAVKSYPK-----T	3311
DPURPUREUM	SEDRVKSLLQE--RAILYHKMSKARKLGNIVSEAY	FRLSVKSYPK-----T	3274
PVIOLACUM	IVNKKVSTLQE--RAELYHKMSKARKLGNIVSEAY	FRLSVKSYPK-----T	3298
AMPHIPOD	-----IADKVNTE--KANSHIGVVEVALSTGNSLATQ	LSRVDPLVKKGL-----	3258
SHRIMP	--LD--VSNLKDT--KNFTHRFVIRAALHNSNYHLANR	LKXISLSEDE-----	3224
MUDCRAB	--LEDIQKLMKDA--KSSLHKSVIKTALMNNKHYHLANR	LKXLRPLCGDD-----	3218
TARIGRADE	--LSEALMASF--RVHEKLAIVARTAIRQNNFDLSQR	LTKLHPVACKAHQATFFSGNL	3269
HYDRA	--VYLNEIPFRK--VFKMVFGLTAPCLMGNFVAVAKY	LROSHDVILKEV-----N	3129
SALPINGOBEA	LPARIRRLVVE--DAEQCLRMAHQSSQGLKVAEKY	HKIVHHLNFTY-----FDD	3297
SPIDER	-----DFKALANT--SVHMKIRFAENCARKNFVAVST	LKNIYRORS-----L	3236
LIMULUS	ELSRITLDIRQ--EFLLLKRFVDSACKQCIIVASKHL	KWLANKAEH-----L	3292
SCORPION	SYPDSEKFLKQE--RLKMKLKFVEAALLQGNLQVAVKH	LKWSQOIAKE-----L	3261
ROTIFFER	YSKLLKXKMTKT--TFLMKIRFAQAQSQGNFKLSLDK	LKQSRSLIKIKN-----S	3204
CIONA	--EDIQWMEKT--KFQRLRNMMSARLQGNHVVARIR	SSLSKKEHEL--L-----N	3269
OCTOPUS	--DGNYPKFE--KLTQLLRAESCEQNNFKLARTI	LKXISGDCCK-----I	3191
CAPITELLA	-----AKIDPPKQ--RVVMSLAQVDAASLQGNHNSV	ARKLKSADLVK-----V	3234
LIMPET	-----DEGDFHQS--KLRLYLMAESCKEQNNIALTLR	LKKTNSAITS-----V	3218
SCALLOP	-----DMGDTFLES--KLQLHLKMAESCKQNNYKLA	LQILGENSCKQS-----S	3285
LINGULA	-----EEDDKFREK--RLQFILAQAESAVEQHNF	PVAKKXIKIIESEVKS-----L	3244
OYSTER	-----DEEDFLAS--KIHRLKMAESSCHKRNHKLALNI	LADIHKNYRD-----K	3240
SNAIL	-----HSSIFEDI--KLRQQLKLAHSCQEQNNFM	TLRILKETYSKCKR-----E	3249
SPONGE	SSCSVDSMKNE--ANIMFMAADAARTQSNYPAEYK	LKIVKESLQDP-----P	3285
PRIAPULA	-----AGSDPFEQ--KFNPLFLAYQASAMQQRNP	VALKHLRTTNQLLKK-----L	3288
DANTO	SGEELGLVVKTC--KFNMKLQMAESAWKQNNFP	VASKLKLKELHRHA-----K	3266
ESHARK	EEDINMAIRSC--KFNMKLMAESGKQNNFVAVAMK	LKELHKES-----K	3286
BHARK	EEDITMLIRSC--KFNMKLMAESARKQNNFVSATK	LKELHKES-----N	3276
XENOPUS	--QEDIAVMKNC--RFTMKMKMVSARKQNNFVSAMK	LKDLHRES-----K	3289
STERLET	--PEDVGSIRGC--KFSMKLMAESARKQNNFVSATK	LKELHRES-----K	3290
GAR	--WEDPDLKDC--KISMRLKMAESARKQNNFVSAAK	LKALHKEC-----K	3287
HUMAN	QEDISSLRSC--KFSMKMKMIDSARKQNNFSLAMK	LKELHKES-----K	3267
PLATYPUS	QEDDISMIESC--KFSMKMKMIESARKQNNFVAMK	LKDLHRES-----K	3275
TASDEVIL	QEDDISMIRSC--KFSMKMKMIESARKQNNFVSAMK	LKDLHRES-----K	3279
COELACANTH	--EPNISAMVQSC--KFNMKLMAESARKQNNFVSATK	LKELHRES-----K	3284
CACILLIAN	EEDITSMIRSC--KFNMKLMAESARKQNNFVSAMK	LKDLHRES-----K	3287
CANARY	QEDDISMIRSC--KFNMKLMAESARKQNNFVSAMK	LKDLHRES-----K	3276
OSTRICH	QEDDISMIRSC--KFNMKMKMIESARKQNSFSAVKL	LKYLHREA-----K	3246
GECKO	EKEDIHSMIRSC--KFSMKMKMIESARKQNSFSAVKL	LKDLHRES-----K	3286
TURTLE	QEDDISMIRSC--KFNMKMKMIESARKQNSFSAVKL	LKDLHRES-----K	3285
ALLIGATOR	QEDNISHMIRSC--KFNMKMKMIESARKQNSFSAVKL	LKDLHRES-----K	3243
APLYSIA	REAAVAERLEEM--KLWMLKMAESCRVQNNVTLSQL	LRNIRTSCKR-----A	3306
TRICHOPLAX	TFPALKKRIAEE--EVSLEYLKLADTARLQSNYP	VAIKHLRQTYLHINOEL-----D	3264
SOFTCORAL	--TTQLEEIFLRE--RVLFSRLRSEVATQGNFVAVAK	LQSSLHLIRDRL-----K	3282
STONYCORAL	--LDDIKDKFFKQ--EVELKLCMANAAKEQGNFVA	VAHRKLEALYKIP-----Q	3299
SEA_ANEMONE	--VDALRERITRE--EVALQLKMQVAAREQSNFVA	VAHRYLRESLSKI-----E	3251
SEACUCUR	--KVEFEYISME--KTRLSLKLAEASASEQANFP	VALKHLSKSTYGH-----G	3278
LANCELET	--GEPFSHRAQRE--QFLRLRLVADSAREQANFP	VALKHLSKSTYGH-----T	3300
STARFISH	--ETALEKRLRE--RLWMLKMAESARKQNNFSAVK	LKELHRES-----S	3313
SEA_URCHIN	--DQKPDLLVRE--KVLMSMKMADSACQANFVAAKH	LKSTHRGL-----V	3298

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	----CENWSTYSTLAKLK---LKEERFES-DQRDLT--IYQKLNDF-----	3146
TETRAHYMENA	--GLPEFNWYDKITSKLK---LKQLEV---DLKNDQI--P---E-----	3433
STYLONCCHIA	--KN-SQNMKIVAPIIKLK---CEQFKV---DTMNLNF--A---D-----	3380
APHANOMYCEsa	-LPKLTLMHVQ--VYSAQVSKLASRQLQAAT--NL--T-----D-----	2982
APHANOMYCEse	-LPKLSVHMVQ--VYSAQVSKLASRQLQAAS--GL--H-----G-----	2910
PYTHIUM	-LPKVSVMVD--VYVSHVQKLAERQAKSS--SMASH-----G-----	3191
PLASMOPARA	-LPKLNVRMI E--VYVSHVLKLDROEHKSS--DS-----D-----	3157
BREMIA	-LPKLSVQMI E--VYVSHMLKLDVROGYQSS--NP-----D-----	3140
AEDES	---ERGVWRI---A---HLK---LR---RLG-----ELK--SAG-----	3204
MIDGE	---EMIKYKLVAGVYSMVVA---DQK---LT---SVDEKMMKLYNGMKSLVNGI IKAETIG	3225
BOMBUS	---FNEPLLFQCK---LK---YLMGDTET--DMKKKL-----D-----	3068
ANT	---ELLWLDAR---IK---RLHADVET--NMKKKM-----D-----	3119
WHIPWORM	LELENHEAYSI---COMV---OSA---SV---HSDKKV-----D-----	3175
TRICHINELLA	LEASNYETWAL---LQLA---NCA---NA---VKS-RT-----D-----	3170
BEETLE	---QLILSKLA---YIKSLMLN--NSEQKL-----D-----	3029
BARNACLE	---DASLAAEYQLLRQTA-----VLLG-----D-----	3082
THRIP	-SPTLTRWLIARSSERHQ---W---AKREQ--NSVTRL-----D-----	3090
FLEA	--PEKNYRWIS--RCQOI---FLQGILET--DIDKKV-----D-----	3114
WHITEFLY	---NTLYTGKYLKCAQF---A---E---ENEKA-----D-----	3191
TICK	-QLEGSLEWSYAETYSAL---CRAAEQV--PLDKKL-----D-----	3134
TERMITTE	MELQGSLSAYSKAWLQAGL-----KV---TTDEKL-----D-----	3195
DAPHNIA	---LPHYLI---QSK---VLAESS--LDSNVGASNL-----D-----	2924
OSTREOCOCCLUS	---EASEMKLYEALFNLK---LATGT--S-----D-----	3146
STENTOR	---KTSVSLLS--SVIRLK---AKTVIRNS--EYGF-----D-----	2847
KLEBSORMIDIUM	SNQGFDDWFLR--LAAKIS---SLRAERTTRVNPLEAA-----D-----	3425
CLUBMOSS	---SFPNPTVFK--RLVKPR---CLQALRTSERDPKSAA-----D-----	3087
MOSS	AKHRLDFRNFK--ALVRLQ---CLRAERDESAN--NRI-----D-----	3243
LIVERWORT	KNGALDFKFFK--GLVKLR---CLQADRVKLIEASEAT-----D-----	3291
LIGNANO	GSSPTSVAWRA--ACAKAW---TTAALSLD--TDRNF-----D-----	3585
COPEPOD	---ELAQ--MR--SXIISK--VAILN--FTRSDLTAV-----D-----	3100
GLOBOSUM	---EFVP--EF--MQQYK--QTLKSD---RELGFA-----D-----	3071
PALUSTRIS	---FDD--IF--NYNALK--LSFVRM-----KQLQGO-----D-----	3132
NEOCALIMASTIX	---KM---EF--SYEAIK--YIVTELKTLK--DSNERL-----D-----	3228
GLOMUS	---DD--E--RL--SYCFK--LNLREQ--NTI-----D-----	3265
LOBOSPOR	---SY---NI--HYSQIK--LDLARAT--LEM-----D-----	3219
SYNCEPHALASTRUM	---KAEK--QL--VYLQLH--LQWVLSA---EDSSRA-----D-----	3213
FUNGIVORUM	KE--PFDPCR--SLVKLH---NKKALDSK--SLIETA-----D-----	3187
HALBUM	RENDLAFPLVS--SLIKIY---CLKAKNST--TQVETL-----D-----	3342
DPURPUREUM	KENDLAFPLVS--SLLDIY---CIKARTSA--SPIETL-----D-----	3305
PVIOLACEUM	KDNDLAFPLVS--SLLNIY---CMKAKNSP--SPMETL-----D-----	3329
AMPHIPOD	LTESLTVKYHF--LCANTS---I IIGONKR--GSERI-----D-----	3288
SHRIMP	---YSKAQYF--LMAETH---ILRGQG--K---QTDRL-----D-----	3250
MUDCRAB	---ELAKYF--LMTETN---IQGRS--R---PONRL-----D-----	3244
TARDIGRADE	PLRRLEDRWGG--TFAAAA---IAKSRNKTP--QQAQSNF-----D-----	3303
HYDRA	NVSAYGLHWRI--LYAKVY---CKTAKFQND--IGANP-----D-----	3161
SALPINGOBEA	TRLDLMLQQAH--GLVAIH---LHEFH---LGVREKHYF-----D-----	3329
SPIDER	D-GSTWKFIE--AYCSVNI---NORVLSQH--SEKSL-----D-----	3265
LIMULUS	GNSDHRTTWTH--KYCEIY---HQAVMLR--GAEKL-----D-----	3322
SCORPION	KADHWINCIIH--LYCKID---LKKAKNON--YPEQL-----D-----	3291
ROTIFER	DFLDLQLIWNH--CYLNTH---LNKCKQAN--SKESE-----D-----	3234
CIONA	SDKNLSEFKLTH--EAALSY--LAQAESLALNKNPNNKI-----D-----	3304
OCTOPUS	SLMKLKLKWNH--LYVQSC---QKNTLL---SNDTC-----D-----	3219
CAPITELLA	DSEELSVLFTH--SHANAN---KRCAS--GSEPSERL-----D-----	3265
LIMPET	DNEELKVEWSQ--LYASTH---QKKIIS--NDWSEDCI-----D-----	3249
SCALLOP	GSVGLWVKWGH--LYTSTH---HKRAQSVQSSWTDTF-----D-----	3318
LINGULA	SESPVLIQFYH--CYAKLH---NKITEV--TMDASATL-----D-----	3275
OYSTER	ENEILNLEWSH--LYAKTH---QLSAMSADTWTNDIF-----D-----	3273
SNAIL	KSELLVVEWSH--LYATTH---QKKALSCGIWSKMDL-----D-----	3282
SPONGE	DNFYQLRWLH--SLIKVR---LDRHODP--SPTDM-----D-----	3315
PRIAPULA	DSDSLAVQWTH--SYVRTW---QIATGHQ--RDSADR-----D-----	3320
DANTIO	IDDARLLRWVH--SFSRFT---HKRIARLG--PSEKI-----D-----	3296
ESHARK	ARDWAVKWH--TYSRSL---HRSRQA--RPEQV-----D-----	3316
BHARK	IRIDWRVRIQ--SYSRFS---HKRSRSMK--RAEQI-----D-----	3306
XENOPUS	TNEDWVKWH--SYSRYS---HSRSDLT--CSEQI-----D-----	3319
STERLET	NQEDWVVRVH--SFSRFS---HTRSHQOS--SSEQI-----D-----	3320
GAR	ARSHWNLRWAH--GFCRFK---HLYSQAQD--SAEQI-----D-----	3317
HUMAN	TRDDWLVSWVQ--SYCRSL---HCRSRQSG--CSEQV-----D-----	3297
PLATYPUS	TKDDWLVWRNH--NYCRCS---HSQSOSQS--SPEKI-----D-----	3305
TASDEVIL	TREDWLVWRNH--SYCRFS---HSRCIQOS--SSEQI-----D-----	3309
COELACANTH	SREELTRVWH--SYSRFG---HSRSQSQS--CPERI-----D-----	3314
CAECILIAN	TRODSVVRWH--SYCRHT---HSRSQSQT--SPEQV-----D-----	3317
CANARY	WREDWLVWRNH--NYCRFT---HSRNLIS--CPERV-----D-----	3306
OSTRICH	TREDWLVWRNH--NYCRFT---HSRNLIS--CPEQV-----D-----	3276
GECKO	TREDWLVWRNH--SYCRFS---HSRNLIS--NPEQI-----D-----	3316
TURTLE	TREDWLVWRNH--SYCRFS---HSRSOSON--SPEOM-----D-----	3315
ALLIGATOR	TRDSWLVWRNH--SYCHVS---HSSCQOS--SPQOI-----D-----	3273
APLYSIA	SNKQPLEVWH--LYAKTH---HTKAGNTPPWADDTF-----D-----	3339
TRICHOPLAX	KDELLTVKWH--IYTKVH---CDKSLTLP--PDERL-----D-----	3294
SOFTCORAL	NDESEVLVWTH--SYGDLN---CKKCPNLL--PSEAV-----D-----	3312
STONYCORAL	GNEENLVVWSH--TYAEVH---FRKIQTLT--AVGAV-----D-----	3329
SEA_ANEMONE	---DNLHVKWH--AYAVTQ---QKKAHGLM--AIDAV-----D-----	3279
SEACURE	DHEDLKLWTH--TYVRMH---QRKASLLT--AAEKV-----D-----	3308
LANCELET	EDDPLRLRWTH--CYARLH---QRKASLLT--GAQKL-----D-----	3330
STARFISH	AHEDLKPWTH--SYVQMH---QKILLTIE--LKEQV-----D-----	3343
SEA_URCHIN	EFEDLRPAWTH--SYVSMT---QRKALLK--PYERI-----D-----	3328

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----DRY-----DQHKKLLK-----FFSQQAQ-----KNTE---KPVQFR	3174
TETRAHYMENA	-----NPF-----EKFSKLIK-----IFEQEKE-----KYIHQ-LDQSQIVK	3464
STYLONCHEIA	-----KG-----DKLQKIVK-----VFDKMQ-----ESFGE-DQ-----	3404
APHANOMYCEsa	-----DHQRVLA-----QVANYYA-----ALTRLFDN	3005
APHANOMYCEse	-----NDRARVIS-----QVTNYA-----ALTRLFEN	2933
PYTHIUM	-----GLTSDAIN-----TITRYYO-----TSTKMPDN	3214
PLASMOPARA	-----TSLK-----LITKYFE-----TATKLFNN	3176
BREMIA	-----SSNP-----LITRYFN-----TATKTFDN	3159
AEDES	EPAVS-----Y-----QKLDRIWQ-----RLKAVVE-----EAGSENYKA---VK	3236
MIDGE	EVEVPOIKIEAYSCASEISLRLWR-----IYKKCSE-----DETIEI-----	3262
BOMBUS	-----SHYSSSWK-----HCHDLLR-----QNSIVDTTN---VS	3094
ANT	-----ISYDTSWE-----TLHKLLK-----SNKLDTISS---TA	3145
WHIPWORM	-----QVFRRAVE-----LFENCKI-----SH-----ET	3194
TRICHIANELLA	-----AYLMQALN-----LFDLKRI-----SD-----PE	3189
BEEBLE	-----NVILQGIK-----TLVPIFE-----ET-----ES	3048
BARNACLE	-----RDPVRTWR-----VLDDQVR-----WRD-SAPP-----LP	3106
THRIP	-----DNLLKVR-----QLDVLVA-----SDDLDDHPD---LS	3116
FLEA	-----QDCHRSWD-----MLESKE-----IDNLKYYPN---L	3139
WHITEFLY	-----KKINQSWN-----ALDSMRK-----MAIEDDLQC---MR	3217
TICK	-----ASHLRTLQ-----KLEATRA-----EGLDDAAST---VR	3160
TERMITTE	-----KLGDSWS-----VIEDORS-----A-----FQ	3212
DAPHNIA	-----DRLLAKRVA-----TINRAVF---A---STGVP---KDRWBED	2953
OSTREOCOCCUS	-----NSTEKALEMC-R---NQLHEEK-----WQ-----DDHIN	3172
STENTOR	-----DLAIQHFORL-YE---SIKQYKS-----NNEDKDA	2873
KLEBSORMIDIUM	-----GOLSQVMR-----ELSDKAA-----G-AA---GVLGVSAA	3451
CLUBMOSS	-----AMLEQVLD-----YVRQAS-----KPSIS---GCDDWRRV	3115
MOSS	-----KKLQQLLV-----YIETERR-----K-LS---KHPEFLPE	3269
LIVERWORT	-----EMLQQVLN-----YVKSTAQ-----KPWVE---SSHDWQMG	3319
LIGNANO	-----DAMSVAE-----KVAKV-----RR	3599
COPEPOD	-----DNFCLLPK-----SMNS-----SOLS---EENRNLA	3124
GLOBOSUM	-----NRFKPLENLL-----KHMDYKK-----SIRE---TPNTVOLK	3101
PALUSTRIS	-----EMFEIAGKAM-----QNFAYYKT-----GIEK---LEALQRAK	3162
NEOCALIMASTIX	-----KKIVSLGISL-S---SLYKKLEK-----D---PNDQLLAK	3256
GLOMUS	-----DTEKABILLALS-----EFKVKYS-----SDSR---DD---FK	3294
LOBOSPOR	-----DRVVKAGIL---ADSLKFEYIS-----NDRD---FDSTQIAG	3252
SYNCEPHALASTRUM	-----SOLLGRGIGLYEQEELRPLLA-----SSD---YA---RE	3243
FUNGIIVORUM	-----DKLTKALK-----FVQNKEE-----EBIL---NNKSYQSM	3215
HALBUM	-----DRFIKALK-----FVESKSD-----EDSIK---NNPDNLQR	3370
DPURPUREUM	-----DRFVKALK-----FIESKKN-----EESIV---SINENLQK	3333
PVIOLACEUM	-----DRFVKALK-----FIDSKKD-----DETTA---SSQNLOK	3357
AMPHIPOD	-----KSLVEAWC-----RQLGEVEK-----LQERF---TSPFVNME	3317
SHRIMP	-----KYLVEAWA-----KYLGRVSS-----MSILD---QNPVVEIQ	3279
MUDCRAB	-----QYLVEAWV-----KFLGKVTSS---MPVLE---QDATIETE	3273
TARDIGRADE	-----AGLMQSLG-----LIDKHLG-----KSTAA---NAVPLRSLE	3332
HYDRA	-----TALVSVIG-----HLEKQSFDKTIATMLLE---FDGWR	3192
SALPINGOBECA	-----RANARDLD-----RLANKCSADLPSSKSG-----AHSLYKA	3359
SPIDER	-----DIWVGSYK-----QLCELEKRCGSGVS-----	3287
LIMULUS	-----KILLRAKE-----QLMKLDDTVARSNI-----SEAKTH	3350
SCORPION	-----DTLLCAHK-----QLAKLDLHFPKKLD-----VSTMN	3318
ROTIFER	-----ESFFESMVLRL-----EILKYDSI-----SDTFKNNQKNLYQE	3267
CIONA	-----KYFIDSVE-----CLNEQNE-----FITE---SATNIERI	3331
OCTOPUS	-----INLVNNLK-----ILCEHDL-----SLLPP---EEQSLRWK	3247
CAPITELLA	-----V---EVKK-----RLDKCSE-----SSTLK---LNAALLCD	3290
LIMPET	-----NGLLT-----TIGKFND-----SDVLK---SKPDLYRR	3274
SCALLOP	-----TSITSTVD-----LLGKNST-----SDTLE---ETPAPGRH	3346
LINGULA	-----SPVLGALG-----LLERKRD-----HKLVK---ESNVLTRR	3303
OYSTER	-----SSVITTTID-----RLGKFKD-----SSLFE---REAGLGRR	3301
SNAIL	-----INVLSTLD-----PLSKVAE-----SKMLR---EKPALGMR	3310
SPONGE	-----EAVISLTC-----QMDNFKRLLGSSKGAIS---SK---PTISQ	3348
PRIAPULA	-----HRLLDITIK-----ELDKHAG-----KAVLH---QORGLARE	3348
DANTO	-----NALLKTVP-----LL-KDAE-----RQSEA---LSARMLRD	3323
ESHARK	-----VTVLKSIP-----LL-VEIN-----VDYLN---THTRILLRD	3343
BHARK	-----VTVMKTIP-----LL-GEID-----VGNLN---IQRHAFRD	3333
XENOPUS	-----LTALKTIP-----LL-EESK-----TEYLT---KNTKACRY	3346
STERLET	-----LTVLKTIP-----LL-EERK-----IDYTK---ATTRIVRD	3347
GAR	-----LNVLKTVD-----VL-EDSK-----TDPEK---ETAQNFRN	3344
HUMAN	-----LTVLKTVS-----LLDENNV-----SSYLS---KNILAFRD	3325
PLATYPUS	-----LTVLKTVS-----LL-DDNL-----SSYLS---KNIVASRN	3332
TASDEVIL	-----LTVLKTVS-----LLADENL-----SSYQS---RNSLAFRN	3337
COELACANTH	-----QVMKTIS-----LL-EESK-----ADYLN---KNTRALRD	3341
CACILLIAN	-----LSVIKTIS-----LL-EETK-----ADYLR---ENTRAFRN	3344
CANARY	-----LSVLKTIS-----LL-EDTK-----SDYLS---KNIMAFRN	3333
OSTRICH	-----CSVLKTIS-----LL-EDTK-----SDYLS---KKVTAFRN	3303
GECKO	-----LTVLKTVS-----LL-DEAS-----SGTSL---KDRLAFRN	3343
TURTLE	-----LTVLKTIS-----LL-DESK-----SDYLS---KNIVAFRN	3342
ALLIGATOR	-----LTVLKTVS-----LL-DENV-----PDHLS---KNIEILRN	3300
APLYSIA	-----GNVLSTLD-----ELDKMKG-----SPALY---ERPDMGLR	3367
TRICHOPLAX	-----KTLTANS-----QFEKVKD-----LSVIL---ENTTLMRE	3322
SOFTCORAL	-----DTAISALD-----QLDKIKD-----SKVLQ---ENASTGIR	3340
STONYCORAL	-----ETALLVAG-----QLDKFSA-----SKILE---IEPLRGIQ	3357
SEA_ANEMONE	-----QTALSTVS-----KLGKPSI-----NTLA---NDPVIALR	3306
SEAACUKE	-----TTLTTFD-----PMSKLEN-----TESFK---TMRNPFQS	3336
LANCELET	-----NNVLTTFE-----QLDKFSS-----CRVFE---EDLAVAKQ	3358
STARFISH	-----MILLTFD-----PLAKLSN-----TPALT---GDVCLTRH	3371
SEA_URCHIN	-----TSLLKALD-----HLGKLPV-----SHNLG---SDLFILLCD	3356

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	FNMLP-IISNQHYLKI---NQDLVFM-----FNQ--ESRK--HNNR-YDFNP---	3212
TETRAHYMENA	FQLN-IQVNEKFIDV---YQDYTLTQ--IVEDIFL-EKYA-DV--INNIYWGYNKLFQ	3513
STYLONCNCHIA	-----QF-----QEDLRTE--I-KCILLKQKLEKMK--LNIIFQGVS---	3436
APHANOMYCESA	DEVLV---FIPPTLP--ATTQAD-----IYGW-QA-----	3028
APHANOMYCESE	DEVLE---LISTMP--PDAQAE-----ICGW-QA-----	2956
PYTHIUM	TDILE---LMESLP--LHDRV-----MGSL-EA-----	3237
PLASMOPARA	VEIMH---MMKIAT--ARDQVA-----VGYL-EA-----	3199
BREMLIA	AEIMO---MMETAA--VSDKVA-----MGYL-EA-----	3182
AEDES	VAGLH-----E-----LF-Q-----	3245
MIDGE	-----	3262
BOMBUS	-----SRKQISMIASKIK-FSEE-----NETP-AELLR-----E-----	3122
ANT	-----IREHICTMASKIES-LSRE-----NIVP-AKYLA-----C-----	3173
WHIPWORM	FSRYG-HLTLDHITLKA-VLYNSV-A-----DCFL-N-----STKVGNHFLKE	3233
TRICHINELLA	VNVTE-GSSADQFALIG-MLFDNV-A-----ETVV-A-----SSENT-----	3222
BEEBLE	FLQLS-AHVT-FFKHLD-YISSLLSQN---EDLL-QNRQS---D---LM---	3084
BARNACLE	VGLLL-RRR---RLEAEALAE-----RCLL-EPAAV---A---DPFVS---	3137
THRIP	V--IA-HSV---ESNLALTIRETLSAE---PHSL-NTLIK---NQSDGHNWLC-	3156
FLEA	YIDVH-HSIVDVTKLFFKHLIFE--N---ANIL-ENYPS---L---ENF---	3174
WHITEFLY	FSLMA-DVIVSSFRIRIMP-KISAD--N---RNSF-EKKVR---S-----	3249
TICK	YCLLK-AQAV-----AGLAKLDA-----GAVL-NKQOM---A---ELQ-L-	3192
TERMITTE	YPMLEH-AETLQHVSVMAAGILQLEQQ---PGVL-TKLPA---A---EVKKL-	3253
DAPHNIA	LERFE-ASLCAQ--V---FQLVDNIQ---PK---ELT-----	2978
OSTREOCOCCUS	CSLLE-ARMCEH--L---A-----	3185
STENTOR	INVLF-GQIYSN--E---T-----	2886
KLEBSORMIDIUM	VRLLQ-ADLAAQ--L---ARV-----CV-QHHG-----	3472
CLUBMOSS	TMLVE-SDTSAQ--L---GRT-----KL-DLLI-----	3136
MOSS	FQMEQ-ADVNR--V---AWA-----TL-SSQS-----	3290
LIVERWORT	LRLLQ-ATVSSQ--L---AMM-----NL-DQAS-----	3340
LIGNANO	QLISP-SPTWEE--L---LAAGLCDRA--S-----	3621
COPEPOD	WNIHQ-RDINEC--L---FTIVDKNS-QL-TPSIL-RRQMK-----TD-	3158
GLOBOSUM	FITLE-TRTLRSR--L---LSLTHCL--S-AN-DSFFSDL-----GSN-	3133
PALUSTRIS	FLSLE-GRLYDT--I---VQAVLDE-----KDLA-ELFLSNK-----HLK-	3195
NEOCALIMASTIX	LYQLD-SNLSSI-----ILDDK-----KSMH-QSLLSEC-----QNN-	3286
GLOMUS	HRILE-SEFYGL--L---VSELDR-----VNR-NLL-----KI---	3322
LOBOSPOR	LNMLG-SKAYSIL--L---RELITDD---RTIWH-SHL---K---	3279
SYNCEPHALASTRUM	YFLTG-SKILLET--A---RLYLQSD---PKML-EQM-----RVS-	3272
FUNGIVORUM	PTTLQ-ANVLAE--V---SRLSLT-E---E-----NVVR-----	3239
HALBUM	YKRLH-GNIQWE--I---YQLDKLG--S-----NLVM-----	3395
DPURPUREUM	YLMMH-GDIFWD--I---YQLDKLG--S-----KFN-----	3358
PVIOLACEUM	YLMMN-GDILWE--L---YQLDRKLG--S-----ELVS-----	3382
AMPHIPOD	YLCVE-SKLCVE--L---CNAIQSLG--GNF-DAQN-----	3344
SHRIMP	YLKLE-SHLGLE--I---CRAIQDMG--DDW-TEDN-----	3306
MUDCRAB	YLKLE-SSLCVE--I---SEAMKDMG--NSW-QEDD-----	3300
TARDIGRADE	ADILL-----A--V---ADTLHDFG--SS-VSLET-----	3354
HYDRA	CLL-----L--C---NSRLQND---EF---KLI-----TCET---	3213
SALPINGOBECA	EVLLSLGKIVPL--C---PAT-DEN---KVLW-DHIIAEVDAPATRAGEKCIV-	3403
SPIDER	QKLL-SEITEL--I---ARMPMKO---K-SLF-DTITV-----	3315
LIMULUS	HSYLH-SFNAEM--I---AESLIED---DVSVV-SELDY-----	3379
SCORPION	HYLLQ-SEIEM--A---ADIVKYN---DVH-----A-----	3341
ROTIFER	QRVLH-SKFSKF--L---IESLMDHMNQTDFDGL-QGIIITEK-----	3303
CIONA	HLLALATTHHL--T---SSNLNG-----E-D-----	3353
OCTOPUS	HNVLY-GEHLSS--L---ASVLKNEG--D-EFQF-ENLPL-----	3277
CAPITELLA	QHLLQ-GEHLVT--M---ATILQNG---VKDI-DALDQ-----	3318
LIMPET	HHVLT-ATSYEL--L---AESCL-A---AELP-QSLSS-----	3301
SCALLOP	HFVLL-GQTHEL--L---VDGIR-S---VSLG-GCLGD-----	3373
LINGULA	HLVLQ-GNIFDS--V---TSSLL-S---LPDF-SSVSP-----	3330
OYSTER	HFVLL-GQAFGL--L---VKGVO-S---ENCF-SSLSL-----	3328
SNAIL	HMILLE-SRTFPA--V---VNGLM-S---VGNL-EELGD-----	3337
SPONGE	HHVLL-SKLLNK--M---AEIFATPE--DMLAL-SALSIV-D-----	3380
PRIAPULA	NLLK-GRSIEA--V---AREVLTR---PACL-HTLPA-----	3376
DANTIO	QRILL-GTTPYDL--M---AGAADRS---PPAL-ETLGE-----	3351
ESHARK	QNTLL-GSSYCI--L---ADALNKE---PTCL-QRIKE-----	3371
BSHARK	QNTLL-GTTYI--M---ANALNKD---PSCL-QYIEE-----	3361
XENOPUS	QNMLL-GDYRI--M---ADAVCKE---PDCL-YKIED-----	3374
STERLET	QNILL-GTTYHI--M---ANALTRD---GLAL-EHIGE-----	3375
GAR	QKLLL-GTTYHI--M---ASAVSRD---PSVL-EKIGP-----	3372
HUMAN	QNILL-GTTYRI--I---ANALSSE---PACL-AEIEE-----	3353
PLATYPUS	QKLLL-GTTYRI--M---ANALSKE---PACL-EQIER-----	3360
TASDEVIL	QNILL-GITYNI--I---ANALSNE---PTCL-AQIEE-----	3365
COELACANTH	QNILL-GTYMI--I---ANALNKT---PTSL-QDIGE-----	3369
CAECILIAN	QNILL-GTYSI--I---ANALCKD---PRCL-QRIDK-----	3372
CANARY	QNILL-GTYIQL--M---ANALSOD---PRCL-EQIEK-----	3361
OSTRICH	QNILL-GTYRI--M---ADALSHD---PRCL-EQIEE-----	3331
GECKO	QNILL-GTTPHI--M---ANALSKD---PRCL-EQIVE-----	3371
TURTLE	QNILL-GTYHI--L---ASALSKD---PGCL-EKIEE-----	3370
ALLIGATOR	QNILL-GTTYRI--M---AVALSKD---PRCL-VELEE-----	3328
APLYSIA	HSTLG-GRGVDL--L---LGGLLALQ--ST---EGLSE-N-----	3395
TRICHOPLAX	HLLLR-SRLLDM--T---SKILAES---DASIL-DL-N-E-----	3351
SOFTCORAL	HLLLR-SRNLDA--I---TNVLSIPG---TW-DSLEK-E-----	3368
STONYCORAL	HHILR-SKTFDI--L---CKAMLDG---GVVI-ATLES-Q-----	3386
SEA_ANEMONE	HHILR-SRCFDI--L---TDAIAGA---GRSTL-ATYKL-I-----	3336
SEACUCUR	HQILS-STSFEM--V---ADALNSDT---EANML-GKLR-E-T-----	3367
LANCELET	HHTLT-SLSYEI--V---AHALIQE---GGAIL-TGLKD-T-----	3388
STARFISH	HHTLT-SKSYDL--V---AIALQKG---GAIL-TGLRN-V-----	3401
SEA_URCHIN	HRILT-SKTYQS--M---ASALQEE---KGEML-TRLSD-A-----	3386

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----FYQRY-----ADAIMQT-----FNGYLELQ-----	3232
TETRAHYMENA	NDIMKKDIDLSSQS-----QS-LSQPFE-----NTFSFKGPASLQO---MA---GNN-	3553
STYLYONCHIA	---AEKEIKHLQRY-----QKDCQTYLD-----RS--FKT--LDQ--VI---K-	3467
APHANOMYCEsa	-RALTEAAAFHRE-Y---GDASLGTLE-----RGAMEI---FOY--Q-----	3061
APHANOMYCEse	-RGLMESSDFQRE-Y---GDPSTSVKLS-----SAALEI---FOY--Q-----	2989
PYTHIUM	-KTFGAAQFYMTAD-----LDKSMTEFF-----TRAIDV---FQR--SCRSIPGEI	3279
PLASMOFARA	-KTFAKAAAFYAFND-----LDDLSKFKF-----YRSLDR---FKA--SCRRIDAVL	3241
BREMLA	-KTFANAAIFYSQD-----IDDNLKEIYF-----SRAVDM---FRA--SRRVDAVM	3224
AEDES	TTMELREIVR---SN--PQLGQSMEAQLV-----GHSRQS---LQK--SIVLSEDM	3288
MIDGE	PADFSSREILKLLDVS--DDVDTSNVTDHLL-----RFSELS---LKF--GR-KLAQKI	3307
BOMBUS	NTIILKEINAE---N-N--ELSSIRNPLE-----TYSFNN---LKT--CCD-----	3157
ANT	NSTILRDIGITEPTS-T---HLSNIREVLL-----HYSLNN---LRY--CCS-----	3211
WHIPWORM	IEHFVQSSRA-TTKA-S---SYLNVADCLL-----CNAFDE---LKV--AI-----	3269
TRICHINELLA	LAEFCLSRWIKSKTDT-A--DISELVTMCY-----GQAFRY---LKL--SC-----	3259
BEEFLE	TL---TEVTQSVSS-K--DVAF-----FAANK---LKS--FLHNYNTS-	3116
BARNACLE	QLLEESGHWTDGAR-A--DLVQ-----LAFGR---LSA--AVEAARGS-	3173
THRIP	NKLQLPQVGSCEDIK-S--TLDT-----LGLNS---LIH--SKNIAKKH-	3192
FLEA	ILKHGQE---RGLSHS-K--TLDI-----PGFKC---LQK--SIKYAEA-	3208
WHITEFLY	-ELVSHELLFSTPLE-E---NLRK-----LGLFC---LKE--ALEWAGRT-	3284
TICK	ASTSSDPKMSLELR-E---QALQ-----LHLSA---AHC-----	3220
TERMITTE	ADRI GAPDCSQDTLM-Q---NALQ-----YGLSS---LKT--AAEVV---T-	3287
DAPHNIA	---SRHAKVLELHWQP-----REIQTGLK-----H---AER---QQAIA-	3010
OSTREOCOCCUS	-----SAGDD-----SITYGIA-----AIEN---FTA--I---A-	3207
STENTOR	----KMLLSYKTEA-----ADVLNCA---KQAFYI---L-----	2911
KLEBSORMIDIUM	-EIAERLRSQGTESWGGFSSGQAVVGNL-----GAAFRG---YSD--AVSILDGKK	3518
CLUBMOSS	-D-----KDLN---TNALSQSMALL-----GSAYKT---YSE--LLRNADSV-	3169
MOSS	-G-----EGAT---SQDITACFALL-----GSAFKT---YST--ALDNDPLS-	3324
LIVERWORT	-K-----LDTS-----SSTLDVSLSL-----GSAYGA---YSD--IVSEQFLA-	3373
LIGNANO	-AALLRQLASSPPSTGQANMRAEAEPD-----KSALSN---LQS--AASKADGV-	3666
COPEPOD	-HDLMWFSKYGTVS---DDNSALRSVLM-----NQVLEN---YRD--AAESG---	3197
GLOBOSUM	-KGVTKFVQR-IQS--K--PELMQFFL-----DRAKHN---ILA--IHALD---	3169
PALUSTRIS	-KTI--KSLGFEQPHD---G---TSLLRILT-----SRAYTC---LQ-----QA---	3227
NEOCALLIMASTIX	-SKFSKFIENPFT---GDTNSLIYFQ-----GRGLKR---LLE--TLKIYKHL-	3326
GLOMUS	-----KINMYFI-----ERYNL---FNN--ATKEISLQ-	3247
LOBOPOR	---SNWQSLISSK---AGEADIPKIQ-----QRGYEC---LRA--AAALE---I-	3317
SYNCEPHALASTRUM	-KSAFKWLSRGLHD---A--KSVANTLV-----LSGTRY---LQD--ILKNA---V-	3310
FUNGIVORUM	-EADIKNQWQKPTG-----ENISNELY-----KKALEY---HVK--ASHLAKEAC	3279
HALBUM	-ENLKKNGLT-SLSS---LPTRLSSELF-----SLAYQS---YSQ--SIQLYDSNS	3437
DPURPUREUM	-ESFKKNELPSHLTS---IPINKLDELDF-----NLTFSK---YSE--SIKLEINK	3401
PVIOLACEUM	-DSIKKNQIGGSLSS---TSVNRRLDELDF-----SLTFKS---FSE--SISLSNENK	3425
AMPHIPOD	-AHLALVAKKFPVQ---NDPRSRYQSL-----MCALNA---OVQ--A--CELSDK	3385
SHRIMP	-QYMVLSKFFENA---NGKESWQRELL-----SCSYKS---LQL--AVNCABGKL	3348
MUDCRAB	-KYIKSLAEKFPNA---KDKSSWYKELL-----CCSYKS---LKS--AVNCGEEKF	3342
TARDIGRADE	-ADRQRLGLSSGTDV-----KPLY-----VRVFE---FAE--A-----	3382
HYDRA	-KKLATLSQFEGDKL---EPEK---TIK-----EKAWTA---LSL--AYEKSV---T	3250
SALPINGOBECA	-RAFVLLTQARAP---TDPKALPVGWRKVPKRRRAGQFAY---VSPFGDRVGNVPSHA	3456
SPIDER	-ENMAVSSLSKWK---SDLTIVSEIL-----DQSYSS---LKN--ITMCTSGLA	3357
LIMULUS	-EDQNRKLSI-AGS---TDSRRFIPKFL-----DVSYQY---LQK--GVHYITELQ	3420
SCORPION	-EKIQELTDT-FSI---QSKSKLEIDLDF-----CKNYEY---KCR--AIDIIQVEV	3382
ROTIFFER	-KHVLQLSDYVKND--INDFEKTISSLM-----KHGVND---LL-----	3337
CIONA	-ADIEQVKEIFGTDI---NADNIRQTLN-----NKAFKF---YLK--AAKFEALN	3395
OTOPOUS	-DIQQKISYAGYES--GTLSTKELSOKLI-----ISGCEY---LEK--NVISDDSEE	3322
CAPITELLA	-KLEKITESVGSIPA---LSHQEIVASLH-----EAAVNS---FKS--GVGVA---A	3358
LIMPET	-KTCDKLKNLLKTDN--LDKTQVNI VDDL-----QKSHQE---LKS--AISDSVVTR	3346
SCALLOP	-RNRQRLMDITGVSK---IDETELIESLV-----KRGFEN---MKK--SLHYEDDRN	3416
LINGULA	-RDIQKLEVAASCMSM-QNADMQEIINGLV-----DRGYQY---IKE--AVDIYEEDS	3375
OYSTER	-KNSEKIMGISKASK---LNPRELARCLV-----EEGYNQ---MRK--SLSYDGRG-	3370
SNAIL	-KTEKLLQYQYTK-SP---LKNQDLIKELI-----HHGYES---LRK--VISEVPEDS	3379
SPONGE	-GNTKLSLIGGTPS---TSTKALISEGLW-----IQALSQ---FNA--GVRSGTTLN	3423
PRIAPULA	-ATREKLSLVAGARE---HDHTALVSGLI-----SAGFRE---LRE--AVDVGDEEE	3419
DANTO	-EKVQKILQLSQAS---SIAQVVEGLQ-----IQALEL---LRS--AACKAESEE	3392
ESHARK	-DQAEVRIEHSQSSS---EEIQEVVIGLH-----RKTLYH---LER--AVRKAEEV	3414
BHARK	-ERAKNVKLSGATS---DNPVQVIGLY-----RKAHEY---LQS--AVKKAEEV	3404
XENOPUS	-KGAGVKDLN-----ESPENVVGLY-----RKSLEY---FTN--AVRKATEEE	3413
STERLET	-DKAGKVLDDLGTTS---DNLEQVVVGLH-----RKALQH---LQN--AVKKAEEEL	3418
GAR	-EKAGRVLKLGASS---SNPQQVTAGFH-----KRALGL---MQS--AVKKEVEV	3415
HUMAN	-DKARRILELGSQSS---EDSEKVIAGLY-----QRAFQH---LSE--AVQAAEEEA	3396
PLATYPUS	-NKARKVMELSGASF---DNVQKVIAGLH-----RRAPQY---LTH--AVRKAEEEE	3403
TASDEVIL	-SKAKVLELGSASS---EDAEMVIGLH-----KKAPEC---LFK--AARRAEDEV	3408
COELACANTH	-EKARKIQDLGSAQS---DHPQIVISLY-----RKALSY---LQT--AARKAEEOV	3412
CABELLIAN	-NKADKVLQSGTMS---ENPDEVAASLF-----KKSFIY---LDS--AVKKAEEEV	3415
CANARY	-EKARKVLSGLSL---ENPKVLAAGLN-----KRAFQC---FSC--AVRKTSEEV	3404
OSTRICH	-EKARKVSVLGSSEL---ESPEKVLAGLN-----KRAFQC---FSS--AVRKEEEV	3374
GECKO	-EKARKVVLVSGEKT---DDIGKVIAGLN-----TRAFQC---FSS--AVRKAEEEI	3414
TURTLE	-EKARKVVMVLSGERP---ENSEKVIAGLN-----KKAFOY---FST--AVRKAEEEV	3413
ALLIGATOR	-DKVRKVMVLSGEEKP---DSPEKVIASLN-----KKAFOY---FST--AVRKAEEEM	3371
APLYSIA	--TRTKLAAQANAGA---GTYEQLVNGLI-----SKGFHS---LKA--AVSEEGSRS	3437
TRICHOPALAX	-KKESLYQLANVQH---DSKEKIAAKLT-----SHACQA---LHQ--AVKASKEER	3394
SOFTCORAL	-AKEKHLGLCSSKNP---EQDKILGHLT-----TKSFTT---LQR--AIKIAQTNE	3411
STONYCORAL	-AKNALVKLCRIDET---ESQKVVSDLM-----TKSFTS---LQS--AIKAAKNAE	3429
SEA_ANEMONE	-CLINQPVDKSYCPG---NVCLQIVSGLI-----TRSFST---LQE--ANKAAKQAA	3379
SEACURE	-GKFDKMLMAGQS---SSISAISSGLY-----TKALKQ---LQE--ISDHSK---	3407
LANCELET	-RHAQLTLAAGVSPD---TSDVQTISSLL-----QKHGAC---LQK--AVKLASDEE	3431
STARFISH	-GKLDKLLGVQNR---TRPEQICSTLY-----SKAVYSE---LQK--AVSLAKDD	3434
SEA_URCHIN	-GKLDKLLSKAEQCE---SKPERVQCSLF-----MKSKEY---LDD--AVGTIKLDP	3429

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	---	IQLHDE-NINQSKFYNKAAAMFCERCLR	3258
TETRAHYMENA	---	---NFNS---SEQIFEEIIPMLRKSFKRPFANFCEQLLR	3585
STYLONCHEIA	---	---KVQT---AAQFDQMKKTMAKTYFKFAQPSDKILR	3499
APHANOMYCEsa	---	---TAKATMTSMHVMYIEYLDRKCLE	3084
APHANOMYCEse	---	---TSKATNVTMHLTYIEYLDKIE	3012
PYTHIUM	TMV	---ALSRESEQSFSCRVTYIEYLIDILF	3308
PLASMOPARA	SK	---QSQDDAPPFLRCRTTYIEYINDLLY	3269
BREMIA	SN	---DLREGGSSRFRLRCRTTYIEYINDLLF	3252
AEDES	FDD	---STARSDVALLADCKFKQDQYEQLE	3318
MIDGE	LD	---TNSYMNEMTMLGEVHKLQYQYQVYE	3336
BOMBUS	---	---MTTKNIKECYFSLAKIYDRLL	3179
ANT	---	---QDTTKLGEHYCTLAKIYGRLN	3233
WHIPWORM	-SL	---CSKNRESYRQLTEPHLVMEVYVSKILR	3298
TRICHIANELLA	-QY	---SSQLNIESPKLTEPLMELSSYDRILR	3288
BEETLE	-DV	---CT---DAYIQYADAYVQIAYFAKN---	3139
BARNACLE	---	---PEAADACLEARRPGRQLE	3192
THRIP	-KD	---ASS---FLTEQTAEAYLQIDQVNRNLE	3219
FLEA	-HA	---NNDINIEISTVTNICYKMIQNMH---	3234
WHITEFLY	-ES	---VNQE---TVLADAHMKIVRIMFGVYN	3309
TICK	-K	---ATPV---SVRAEAQRLDARRMNTALQ	3244
TERMITE	-PR	---GNSE---QAVAKAYLQKIKRERAHSN	3312
DAPHNIA	---	---EMQIKFPMAEAYFTIKKISEWKN	3035
OSTREOCOCCUS	---	---ETSKNVEHAVDASLRLAHDAALK	3232
STENTOR	---	---NQVRHTISALKPFRINDMILR	2932
KLEBSORMIDIUM	GSPAA	---LSSGDNGTAEREARRQSKASLKPARINDVLQ	3555
CLUBMOSS	---	---PPSREMARSTFKFACINDLLN	3191
MOSS	---	---EITTGSLSPHDTAKALKFGLFIDELLK	3352
LIVERWORT	---	---LGREKPKASRQLAKISLSPGLFIDELLK	3401
LIGNANO	---	---GPAVDGSSSLQCHLELIRIDSCLL	3691
COPEPOD	---	---NASPDQGMLEGSTVHRLLT	3219
GLOBOSUM	---	---VPSFRFQKLEVGMVDRKTLR	3191
PALUSTRIS	---	---VSASPKDKHRIRISIHIDRILR	3249
NEOCALLIMASTIX	---	---DMTEENKTYLSTLMTIDQSYK	3348
GLOMIS	---	---LKPSMBAKILVKNKIDYFLR	3369
LOBOSPOR	---	---GEDMVRKRLRNPDSINDKVLR	3338
SYNCEPHALASTRUM	---	---ENTRLRAECVWRLEINDNALR	3332
FUNGIIVORUM	---SGS	---QNKMYAKSQLKALINDEMIK	3303
HALBUM	NNNN	---DTHKSKSAYLQFNINDTELQ	3462
DPURPUREUM	NKQSNQ	---TGSSQQLSSQVNNPQSNNNPSSQTSSEINNFNLEKTKIKSAHLKPFANFNILK	3461
PVIOLACEUM	KDQH	---VDKHKSANLKPANFNINDVLR	3450
AMPHIPOD	INS	---EMLDGNLVSSYHQTHTSLAVFEDCIS	3416
SHRIMP	VKS	---DALNQDSSKSDSAHALVKEECVI	3379
MUDCRAB	MQL	---NNLYEGAH-SHSKDIYMTLAKVEDCLE	3372
TARDIGRADE	---	---CERAVDAVPFLRTPQINDQLR	3404
HYDRA	C	---KISTDLDSKLLHHKAYMEMPLIDELLE	3278
SALPINGOBECA	PKFNNKPLDV	---LFPSATAYGSETLMAFVRLREDAVQLQ	3494
SPIDER	---	---NPNVDMTRKSVAAAHMELANIKRYLC	3384
LIMULUS	DAL	---H---HTQMVSTSVHCTTDPHMSLAFINKYL	3452
SCORPION	QK	---H---MIEFDQATIGETYPKFPANINKILR	3409
ROTIFER	---	---KIKDSLKGSLELATINDFYLR	3358
CIONA	NI	---GEGSLQKSYLADAKINDQFLR	3419
OCTOPUS	KSV	---S---VRESIGETHLAIKVNQFQLQ	3347
CAPITELLA	SQ	---PESVCVNKAYMSLVHINDQVLR	3382
LIMPET	SR	---SESFTEADAQIALSKINDKFLR	3370
SCALLOP	SK	---QTYTRDMAFMAVKNINDRILR	3440
LINGULA	SN	---DKS---TWETHMADAKINDRYLK	3397
OYSTER	TR	---TCRYGLEEAYLADAKINDKFLR	3394
SNAIL	SR	---DAVCLQDQVQALAKINDRYLR	3403
SPONGE	PL	---TKDVPFTQSLRELSINDNALR	3448
PRIAPULA	SSA	---S---LASSPSAAHVMSINDYFLR	3444
DANTO	QSF	---S---QQHVNTHGIVEAYMTINDRRLR	3421
ESHARK	QSL	---A---GEHVDIAGVIEAYVNLINDRCLR	3443
BSHARK	QSL	---S---EEHVDTVGVIKAYMTINDRCLR	3433
XENOPUS	QSH	---S---TDQIDVRGIIKAYMTINDRSHLR	3442
STERLET	QSR	---S---TEHIDIPGATEAYMTINDRKRRL	3447
GAR	QSR	---S---ADHVDTAGATEAHTMTINDRKRRL	3444
HUMAN	QPP	---S---WSCGPAAGVIDAYMTINDDQQLR	3425
PLATYPUS	QSH	---S---SEHVDVGGVIDYMTINDRKHRL	3432
TASDEVIL	QSH	---T---TEHVDIAGVIDAYMTINDRHLR	3437
COELACANTH	QSR	---S---TEHIDVAGVIEAYMTINDRKRRL	3441
CAECILIAN	QSR	---A---MEHVDTVGVIKAYMTINDRTHLL	3444
CANARY	QSS	---S---VEHVMVGVVDAYMTINDQYLR	3433
OSTRICH	QSH	---S---MEHVDVAGVIDSYMTINDQHLR	3403
GECKO	QSL	---S---FDHINTKSIDAYMTINDTHLR	3443
TURTLE	QSH	---S---MEHVDLTGVIDAYMTINDRKHRL	3442
ALLIGATOR	QSR	---T---MEHVNLTGVIDAYMTINDRKHLLH	3400
APLYSIA	GGA	---E---VRQTAHTCEANLELAKINDKYL	3465
TRICHOPLAX	---	---GGSSYIEAMMMVINDDILR	3415
SOFTCORAL	NN	---QKNAESVRNLVTSMTINDRDLR	3439
STONYCORAL	GK	---CNTTQTSQTVDMAMTINDNCLR	3456
SEA_ANEMONE	T	---SSSDGTTTCMVEAMMAMPINDRALR	3406
SEACUCU	---	---KSDSVEGESKTAESFVALCKINDRILK	3434
LANCELET	KA	---RQDTSLDKSGIVDAFMAVINDKILR	3460
STARFISH	A	---VTSQSERSMTEAYMTINDRMLR	3470
SEA_URCHIN	ASH	---S---LSSSAKREBQSMAKAHMALINDQLLR	3461

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	VIEPDSGGSND-----LRKILEKNISLDMIADQFVRYIISSFKFNAN----	3301
TETRAHYMENA	LIIESESRDHL-----KRTLKVQYQVLTVEITVGSSFLEYILKCFSLMGGINQPE	3632
STYLONCNCHIA	KMENDQCRVY-----ITNSLKQLNKSEEQVARDIKYIILSL----NH---	3538
APHANOMYCESA	RSTAGTF-----GSLAKAMVETVLFMGAL-ADK-----	3111
APHANOMYCESA	RTSPSS-----TDLVNOFVTNVLWGMSM-ADK-----	3037
PYTHIUM	SEKRAEWMT-----LVEQRTMLESLIENVLGMVA-GDQ-----	3341
PLASMOPARA	KRQLEKLAN-----FADSKVLKLLAENVLRGMAA-GDR-----	3302
BREMLIA	KPQLEKLAK-----LADRRTLVLKLLDNVNLGGIAA-GDR-----	3285
AEDDES	VEVLGE-----TLDLERQLVTALAAAMQY-GSK-----	3345
MIDGEE	SGALTS-----KIQIKHLESIFRALTH-GSS-----	3362
BOMBUS	BHDT-----DIQSKSEFHSILKAMSY-GSL-----	3294
ANT	TEPE-----NDEIIPHDFLSSILKSMFY-DYL-----	3258
WHIPWORM	ALEEELW-----LPGNA-----	3310
TRICHNELLA	KNGHTSL-----VNSECACVMVRSILKSMKN-GSH----	3317
BEETLE	-----OGKKYFKDFMLFVLRAMKF-NSK-----	3161
BARNACLE	ALEETEAGG-----PGAELRGPVRCILWALAA-GSA----	3223
THRIP	NQEGSSG-----TNTIARHLVKALLCAMKC-GSN-----	3247
FLA	--NLKYAEDD-----LKSVMILSMIKSILKAMAL-GSV-----	3264
WHITEFLY	QOEE-----APEEYNQYFIRSLISAMEY-NSE-----	3335
TICK	QEEGTLFPDD-----RRTSLPLSLVRSVLTAMRL-GSD-----	3276
TERMITE	TS-----REDNFGTIDVTSILRAMRY-GSK-----	3336
DAPHNIA	V-----ISDEYRGLIIRSVLSSMRY-GSV-----	3059
OSTREOCOCUS	KLHGDIQAQASISNSC-----AALEAVMLAENMLSQVPERMLKSLMFMVTO	3280
STENTOR	SYEENGENYV-----IGKCLANMDVTGMLAETVSSLOSMKL-GVQ----	2976
KLBSORIMIDIUM	LATGEADQOTQNSTALPPEMTSALAGCTDSGLPPVSYQPPVVKHVLRALSL-DAS	3610
CLUBMOSS	TADDSKWKSEVRR-----SIQDSRQSGFVTSFVFREAMVTNMLRPLSM-DAS	3238
MOSS	LSQOPEERSOMT-----OHHLFGLPOASDLSLLVRHMLKALAL-DST----	3394
LIVERWORT	AAKSMECRDDIRS-----GILQGHATARLPASAYPSVIVKHMEALS-DAS	3448
LIGNANO	EAAPNQPPQPF-----RAALRAQAVDSVLSAMRC-GSQ----	3723
COPEPOD	AEGN-----SIEYGELCVSYHLKSMKA-GCL-----	3244
GLOBOSUM	CVEADE-VST-----KFMGHQPESAKVIHHSIFRAMSM-GSL-----	3226
PALUSTRIS	RMEEEWGVSGD-----LQAFI-DTCLYARMTVITNLLAAMKS-GKR-----	3287
NEOCALLIMASTIX	RIENSINENTL-----KDKDSMNYEYSKILIKYLKALKY-GSI----	3387
GLOMUS	KLDFTEE-----QTQTFDPAQYASNVVTSILQAMEN-GSK-----	3404
LOBOSPOR	HHENERSKGGG-----ESSILSTKDLAVHANLVKSNLISIRD-GEL----	3379
SYNCEPHALASTRUM	ANEDPSS-----KITVVKLDDTDYIAQVITQNYESEM-DVV-----	3267
FUNGIVORUM	S-----GSKDELGDHVVRGVDMAMIF-EYP-----	3328
HALBUM	RRGDQ-----SEDSNRLLAVSVNNSINNAIKQ-EIP-----	3491
DPURPUREUM	DKLQSNNGQ-----INEETLNLALTVIKSILEAIRE-ELP-----	3495
PVIOLACEUM	DKQSTQSNIF-----SVDSENIQLAKSIRSILEAIRE-EIP-----	3487
AMPHIPOD	AWSESIQ-----VDEYLKILVTSILKAMTA-GSR-----	3444
SHRIMP	KWKDHVD-----VSQYSKSLMVSVLRAMAN-GSR-----	3407
MUDCRAB	KWKESID-----VSDYADSLMVSVLRAMSL-GSR-----	3400
TARDIGRADE	KGILDDVVL-----VERGASLKAIKL-GSV-----	3430
HYDRA	NEENSEMKC-----CYAKTMVDSLKAMAM-NSS-----	3306
SALPINGOECA	DRIAMP-----KDSMGRVQVVFETALAMRS-GNV-----	3524
SPIDER	AENAKNFDLKK-----IPSFNEFPRIITESLDLALKY-GST-----	3419
LIMULUS	KKEDATEDAWI-----PNSLPSYPTTLVTSLLTAMRQ-GSK-----	3487
SCORPION	NQEEE-EKTL-----SLSPFTYPSVLSLMLALKM-GNL-----	3442
ROTIFFER	IAENDNDPFE-----KLTLIGMIRSQFPEIIVBEQLFYSIRS-GSL----	3398
CIONA	NGDQAEGLLSP-----TSKSVKVEYAVTMTYVLRAMRI-QSG----	3456
OCTOPUS	DSPS-----LGNMLSSLLKAIKY-GIK-----	3369
CAPITELLA	QRENDEISG-----TKSEEDFPLALVTSLLSAMKN-SSK-----	3417
LIMPET	MKENEEEH-----IKEKVIENYGETIICLLKAMKL-GSM-----	3404
SCALLOP	MVEDDELE-----LSKATIKTFPDTVVVCLNAMRF-DSM-----	3474
LINGULA	LREEDDSL-----TGESIDSYPEAVVTSILRCIEL-DHM-----	3430
OYSTER	MAEDDTKESLN-----LSKECQKNFPETIIVCLINAMKL-DSM-----	3432
SNAIL	LAEENDGL-----VASESMEVFPATAVKCLDAMRA-GSA----	3437
SPONGE	QEDHDDEQST-----GLDTKSFPSIINHPTLAMS-LGSS-----	3482
PRILAPULA	VREDDGTT-----VLPTDGYAETVITSLRAMAL-GSS-----	3476
DANIO	ESEQKEAI-----SSKQSLPEHVVKMMLKALKL-SSE-----	3454
ESHARK	EKEESATAIN-----FSEQOTFPACVNEKILKAMKY-NSK-----	3477
BHARK	EEEESENINN-----FPELQTYPASVVENMLKALQY-NSR-----	3467
XENOPUS	KVEESAVMD-----RADYQNFPEIMVEKMKALKL-NSS-----	3476
STERLET	EEEEAEVST-----FSELPTFPVAVVDTMLKALKL-NSK-----	3481
GAR	EEEEQVSE-----FSELPTFPVAVVDTMLKALKL-NSK-----	3478
KEEENASVID	KEEENASVID-----SAELQAYPALVVEKMLKALKL-NSN-----	3459
PLATYPUS	NEEEGTSVID-----AVVLQAYPALVVEKMLKALKL-NSR-----	3466
TASDEVIL	KEEESTSVIH-----TVELQTYPALVVDKMLKALKL-NSK-----	3471
COELACANTH	EVEESAEVSH-----FSELQTFPAVVENLRLALKL-NSR-----	3475
CAECILIAN	KKEDTTAVID-----HSHLQQFPPTIVVEKMKALKL-NSK-----	3478
CANARY	REBEGLLEIN-----TVDLQQFPPIVVEKMKALKL-NSR-----	3467
OSTRICH	REBEGLLEIN-----TADLQLFPPIVVEKMKALKL-NSR-----	3437
GECKO	KEEESADIN-----AVDLQMPPIVVEKMKALKL-DSK-----	3477
TURTLE	KEEESDVIS-----ALDLQTFPIVVEKMKALKL-NSR-----	3476
ALLIGATOR	KEREGLSDIS-----AVDLQTFPTIVVEKMKALKL-NSR-----	3434
APLYSIA	LLEDD-ELPA-----RCDTSQFPRTVVLCLRAIKG-GQL-----	3498
TRICHOPLAX	HEEDGRANQPK-----GLIDTKIFPEVIRYILEAMAY-NSM-----	3451
SOFTCORAL	MKEEDSEQTP-----RLDMKLFPGIVIRFVLKSMFA-ESA-----	3473
STONYCORAL	KKEVS-VAPV-----EVDTKLFPPIVVRVYMLKSMCY-SSK-----	3489
SEA ANEMONE	RKEEDSDGSPFI-----ISPFGLHYEFVQRFPEFVVRVYMLKAMEH-GSE----	3450
SEACUKE	MKDADDLPST-----TLPLTANFPSTVVKSLTAMRY-SSS-----	3470
LANCELET	HQEDD-EEGTE-----LSSIPGLAAAVSNLQALRH-DSP-----	3494
STARFISH	LKESD-EVPMPT-----YLPQTDNFSQTVVHYTLKAMHY-SSQ-----	3505
SEA URCHIN	QQDDD-DCNPD-----YLPMEAYPSTVNSLQAMNL-NSP-----	3496

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-----OLNKIETLILKVIKVVQKFPN-----	3322
TETRAHYMENA	QKSNKMQMEVETGEKIQENPEKSNQSIQIEFDONMSNLVLMRLI IQQIPN-----	3682
STYLNCHIA	-----EYQNASDILPRLLDITSKYKD-----	3559
APHANOMYCEsA	-----TCAAYFPRVLGLVRDHFA-----	3129
APHANOMYCESe	-----GCSAYFPRVLGLLRHPT-----	3055
PYTHIUM	-----ECSNYLPQLCELIPFPFV-----	3359
PLASMOPARA	-----ECANYFPGLCDVVSPPYD-----	3320
BREMIA	-----ECAHYFPQLCDVVSIPYQE-----	3303
AEDES	-----SARQLFPCLLQLPFLQDG-----	3363
MIDGE	-----DAKFFIPWILQLPYLKNM-----	3380
BOMBUS	-----EAAHYFPCLLKPEYFNQD-----	3222
ANT	-----EAMHYFCLLKERFKQE-----	3276
WHIPWORM	-----VYSL-F-KRTPSIQYQP-----	3325
TRICHINELLA	-----LARQLFPRLLSVMEKYP-----	3334
BEEBLE	-----EGKQLFPCVLMBQEFSL-----	3178
BARNACLE	-----EACDWLPRLLQLADEHP-----	3240
THRIP	-----RARQLFPLLLQLPTLSS-----	3264
FLEA	-----EAKQLFPVLLLEYDEISA-----	3281
WHITEFLY	-----EATQLFPCLLQLECLEIS-----	3353
TICK	-----AAIDMPFRLQLVLSHP-----	3293
TERMITE	-----DARQLFPCLLQLPGLDT-----	3353
DAPHNIA	-----DGQGLFPLVILALKDDCA-----	3077
OSTREOCOCCUS	-----QSLPARHLLPRLLVLRDHMS-----P	3302
STERNOR	-----RADMFPRLGLGFK-YQN-----	2993
KLEBSORMIIDIUM	-----LKPQLVPRVLLVGVQKE-----	3629
CLUBMOSS	-----VGPQLAVARLLSMAGHO-E-----	3256
MOSS	-----LQAQHAVARLLSLVGFSSA-----	3413
LIVERWORT	-----VRAQHGLARVLLSLVGQYPE-----	3467
LIGNANO	-----EASIRFPRLCLLGSADDEASQNPAD-----	3751
COPEPOD	-----AARELFPRLLSLVLENDI-----	3262
GLOBOSUM	-----KAVEFPRLQLILETYPE-----	3244
PALUSTRIS	-----DATEAYPRLLQLEIYEE-----	3305
NEOCALLIMASTIX	-----EGIQLFPRLLQLEIENDES-----	3405
GLOMUS	-----EATELFPRLLQIIEKYHN-----	3422
LOBOSPOR	-----GATELFPRLLQIIEIYPS-----	3397
SYMCEPHALASTRUM	-----EATIRFPRLLELERYPE-----	3385
FUNCTIVORUM	-----EASDFPRLLIETGYSY-----	3346
HALBUM	-----GATEKFPRLLEIISQYEK-----	3509
DPURPUREUM	-----GSDKFPRLLEIITQFEQY-----Q	3515
PVIOLACEUM	-----GAIDKFPRLLELLQFDKS-----L	3507
AMPHIPOD	-----VSHFNFPRLIHLMEDHAE-----	3462
SHRIMP	-----DAHFFFPRLINLMEDAS-----	3425
MUDCRAB	-----EAHFHFPRVINLMSDDSS-----	3418
TARDIGRADE	-----EARDLFRLVWLRHPN-----	3448
HYDRA	-----KARIAFPRLQVNLFPSS-----	3324
SALPINGOECA	-----LMROYFPOLLNLGERPTD-----	3542
SPIDER	-----DAHLFPRLQIIEENPS-----	3437
LIMULUS	-----AAMQLFPRLLQVLELYPG-----	3505
SCORPION	-----NAILFPRLQIIEVYPD-----	3460
ROTIFFER	-----EARTFPRLQIIEIY-----	3416
CIONA	-----DLKASMSFPRLQLVODFRG-----	3477
OCTOPUS	-----EAQRFRLQLLETHAE-----	3387
CAPITELLA	-----DARQLFPRLLQIIEIRFPQ-----	3435
LIMPET	-----EATIRFPRLQVLELYPD-----	3422
SCALLOP	-----EAKQRFPRLLQVLEHYPD-----	3492
LINGULA	-----DARQRFPRLLQVLEHYPD-----	3448
OYSTER	-----EARQRFPRLLQVLEMYPE-----	3450
SNAIL	-----EALERFPRLHIIEHYPD-----	3455
SPONGE	-----KARELFPRLLQVLEHAPD-----	3500
PRIAPULA	-----EARDSFPRLQLVDLYPD-----	3494
DANTO	-----EARLKFPRLLQVLEHYPA-----	3472
ESHARK	-----EARLKFPRLLQIVELYSA-----	3495
BHARK	-----EARLRFPRLLQIVELYPV-----	3485
XENOPUS	-----EARLKFPRMLQIIEQYPS-----	3494
STERLET	-----EARLKFPRLLQIIELYPA-----	3499
GAR	-----EARLKFPRLLQIVELYSA-----	3496
HUMAN	-----EARLKFPRLLQIIERYPE-----	3477
PLATYPUS	-----EARLKFPRLLQIIERYPE-----	3484
TASDEVIL	-----EARLKFPRLLQIIERYPE-----	3489
COELACANTH	-----EARLKFPRLLQIIELYPA-----	3493
CAECILIAN	-----DARLKFPRLLQIIELYPA-----	3496
CANARY	-----EARLRFPRLLQIIERYPA-----	3485
OSTRICH	-----EARLRFPRLLQIIERYPA-----	3455
GECKO	-----EARLKFPRLLQIVELYSA-----	3495
TURTLE	-----DARLKFPRLLQIIERYPA-----	3494
ALLIGATOR	-----EARLKFPRLLQIIERYPA-----	3452
APLYSIA	-----EARERFPRLQLPELYPD-----	3516
TRICHOPLAX	-----DARQRFPRLLQIVERNPN-----	3469
SOFTCORAL	-----EARQKFPRLLQVLELYPG-----	3491
STONYCORAL	-----EARQKFPRLLQIVHYPD-----	3507
SEA_ANEMONE	-----EARNRFPRLLQIVELYPH-----	3468
SEACUKE	-----EAKQRFPRLLQIIETYPE-----	3488
LANCELET	-----EARQRFPRLLQVLEIYPD-----	3512
STARFISH	-----EARQRFPRLLQVLEACP-----	3523
SEA_URCHIN	-----EARQHFPRLQLVEKYP-----	3514

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	QIGPVFQDAV-EKGHLE-TWITLQVLEPLIHLIN-D-----NV-RFOYFKRIFDDFI	3370
TETRAHYMENA	MTGQKFKKAL-ELQIIP-SIPIISFLPMMHILK-K-----QN-LVEFFPEPLIKKIA	3730
STYLLONCHIA	HVQGDV--IA-YSKETP-TVYLRWINGIVVWV-R-----PE-SS-VIEEKVIQID	3604
APHANOMYCESa	DLLPILTSKM--QVPP-LWTCLHSAQIMMLDVH-----ATPF--NDWLSLLETMA	3177
APHANOMYCESa	-LINMAREKL--KQIP-LWTCLHSAQVMMLMEK-----PSPF--NDFILTLLEMM	3102
PYTHIUM	IVAKFEKRL--SEVP-MWTCLRWAGLLLVN-----GPI--GKSVLILEKMA	3404
PLASMOPARA	IVAECKQCVL--TDVP-LWTCLQSAQMLMLN-----GDI--GMTIVAILEKTA	3365
BREMIA	IVTDFEQVVM--KNVP-LWTCLQSAQMLMLN-----GPI--RRTVLVILEKMA	3348
AEDDES	TLHGCFNEAS--HPVP-EWMLRWIPOLISVVD-F-----SQ--QSFLKALLTRIN	3408
MIDGE	ELTSQFNNQL--TLVP-EWMLTSVYSIMMSVYD-F-----EA--DCYLDELIMRPA	3425
BOMBUS	ETKDFPKKEI--ESHL-TMLPLSAGLLFSLH-T-----SI--APLITPVLKRM	3267
ANT	QTRNFFVEEC--AKLR-PMLLRWVGLLFLK-R-----TFFINRSTPSI--AIALITPVRRA	3329
WHIPWORM	DCRSTFVRES--QVPP-TLTLGLMLDILLVVD-S-----SW--GCCFTEVINRHA	3370
TRICHINELLA	ESELEFQAEI--DSVP-SMMLSNMOMLSALK-R-----S---NKFYSILIERL	3377
BEEBLE	EEQQLFLTET--EQIP-VMLKLPITLIVLD-S-----SK--VTVIXPLVLKIA	3223
BARNACLE	PAAALADGW--EAVP-EIRFLAWLPOLFSYGA-SA-----GC--GGTVRRLLRLA	3286
THRIP	NLSKDFAEKS--SSIP-VMMFLGWPOLLMLD-S-----PA--AKLVAPLLLKIA	3309
FLEA	DMKDVLELS--AQVP-EWMLFQWAPOLLACL-S-----NR--SETIGPIVIRVA	3326
WHITEFLY	EMSELFKNQC--KRIP-EWKFLEWVPLLALY-S-----PK--VAASDILLRLA	3398
TICK	LCKGSFAECC--AKVP-CMPLGWIQMLPLD-G-----AV--GPHLPLGLVDSIA	3338
TERMITE	SLSELFHKES--SAVP-VMMFLGWNQILLACL-T-----PV--GPVLHDLILRLA	3398
DAPHNIA	-FTHAFETLR--CDVP-LMFLPWNQIVSYFI-S-----SSAIPKLLIDTA	3119
OSTREOCOCCLUS	QTAEYSQTL--LRVP-SHLFDIPEGLSMVSDT-----QL--HAVVSPILRRDL	3348
STENTOR	-VAKIFMEL--EQIP-EWMLRWVGLLFLK-R-----PE--CMVFAKIMERL	3037
KLEBSORMIDIUM	-TLAEFGCV--ESVP-SWVLSVWVPLISWV-Q-----PE--GRVLRVLRVA	3673
CLUBMOSS	-IQAIFSARI--DKVP-SHTLGLWLPOLLMLD-S-----RE--GGLFGLILESIA	3300
MOSS	-TQNEFERPL--DNV-SVFNVAWIPMLNIR-E-----DS--GRVLKVLLESIA	3457
LIVERWORT	-THTQFADVV--KQVP-CVFSWIPOMLWVD-Q-----DE--GNILVPLVENV	3511
LIGNANO	SLSSRFSRQM--ASVP-VMLSLPWLPLVSLD-K-----PDQGSVAVLPLESVC	3798
COPEPOD	-AGKTFEDNW--STVP-SMMLPWSNQLISCLIND-EI--SKYFPVVSXMS	3307
GLOBOSUM	-VANDFSVHS--QDVP-TMMLRWLPOLLSELD-K-----VT--GLTLPLVQKIS	3288
PALUSTRIS	-TADDFORMA--TSVP-SWTLRWMPOMMLD-K-----PS--AQAVVPVIEKIA	3349
NEOCALLIMASTIX	-NQAFIKNI--EGIP-PMLLRWIPITLILLD-K-----DC--GYTLIPLLKRIA	3449
GLOMUS	-TQSIFKEKV--ESISVVKFIRWIPIVAILD-Q-----SI--AHCVPPIFKIA	3467
LOBOSPOR	-SQKPFTEHV--TDLGSRVTVRWIQMVAVLD-K-----PI--GACVMPILKRIA	3442
SYNCEPHALASTRUM	-VQKSFVHA--EAFVSMMLRWLPOLVAILD-T-----SL--AHCVPPIFKIA	3430
FUNCTIVORUM	-SNRIFSKLI--REIP-TQTRWIPITLILLSD-----SQ--CDVPLKIMERL	3391
HALBUM	-AAKEFVEVT--KQIP-CMMLRWVDSMPFYL-T-----PO--GPYILPLIQEIA	3553
DUPURPUREUM	QVNKEFTEHV--SNIP-CMMLRWVDSMPFYL-L-----PO--GPLLPLILLDIA	3560
PVIOLACUM	EIITEFKELI--STIP-SMMLRWVDSMPFYL-L-----PO--GPLVPLILLEIA	3552
AMPHIPOD	-LIEVFOREI--STVP-VMLFLWLPOLLMLD-K-----TP--GRVLRPVIQVLA	3506
SHRIMP	-LLSSFKEEY--EKVP-IMMLLWLPOLLMLD-K-----VP--GVALQPVVERIA	3469
MUDCRAB	-LVATFKKEA--KKVP-VMMFLWLPOLLMLD-K-----LS--GEALQVVEKIA	3462
TARDIGRADE	-IEDAFQVGC--ADIP-AMMFIQWANOVLALD-K-----PE--GNAVHDLGRMA	3492
HYDRA	-TGELEFQVC--SOVP-CMPLGWIQIVSMID-M-----PI--VVHLKPIIDGIV	3368
SALPINGOEA	-SDHLQRVLASATTSVP-CMPLNWIQOMLAILD-A-----PE--APVVOQVILKRIA	3589
SPIDER	-CLQVFEKRV--SKRP-CMLTGWIDMVAILD-K-----PE--AKAVQCIIEKIA	3481
LIMULUS	-CSEDFVKKT--NEIP-SMMLRWVDSMPFYL-K-----PE--APPLHGIVERMA	3549
SCORPION	-TIPEFLAKS--KVVP-CMMLRWVDSMPFYL-K-----PE--ATAVQHIIEEIA	3504
ROTIFFER	ECLKFKVSS--EQIP-SMMLRWVDSMPFYL-K-----PO--AKAVQHIIEEIA	3461
CLIONA	NILDSFTQES--SALP-SMMLRWVDSMPFYL-R-----DV--APAVQPIITRYIA	3522
OCTOPOUS	-SIDIFINES--KKIP-CMMLRWVDSMPFYL-K-----PK--AYALHDIVYIA	3431
CAPITELLA	-TREVFRKKS--RDIP-AMMFGWVSIICAILD-K-----PE--SSAHEHILLNIA	3479
LIMPET	-TMPTFLKMVSENRFLP-LMMLLWVDSMPFYL-K-----TE--SPAQVILLQIA	3469
SCALLOP	-CMGTFVVKC--EEVP-CMMLRWVDSMPFYL-K-----PE--APAVQVILLKRIA	3536
LINGULA	-TMQGFINKV--SVIP-CMMLRWVDSMPFYL-K-----PE--APAVHNLIRIA	3492
OYSTER	-IRSTFVEKS--GOVP-CMMLRWVDSMPFYL-K-----PE--GSTVHHILLTEIA	3494
SNAIL	-TDMFLKKS--ETIP-SMMLRWVDSMPFYL-K-----HQ--AHAVRPIILRLA	3499
SPONGE	-TMDLMIKKS--STIP-CMMLRWVDSMPFYL-K-----PE--SRAVHDLIRIA	3544
PRIAPULA	-TLPLLTSKV--ESVP-CMMLRWVDSMPFYL-K-----RE--ARAVQVILLSTA	3538
DANTIO	ETLDLMVREV--VSPV-CMLLFGWISOMMLD-K-----DQ--ATAVQHIIEEIA	3517
ESHARK	ETLDLMKKEV--SSVP-CMMLRWVDSMPFYL-K-----KE--AVAVQHIIEEIA	3540
BSHARK	ETQDVMTFVG--STIP-CMMLRWVDSMPFYL-K-----KE--ACVQPIIEKIA	3530
XENOPUS	ETLDLMAREN--CTVP-CMMLRWVDSMPFYL-K-----KE--SIAVQHIIEEIA	3539
STERLET	ETLDLMKKEV--SSVP-CMMLRWVDSMPFYL-K-----EE--AVAVQHIIEEIA	3544
GAR	ETLDLMKEM--SSVP-CMMLRWVDSMPFYL-K-----KE--AVAVQHIIEEIA	3541
HUMAN	ETLSLMTKEI--SSVP-CMMLRWVDSMPFYL-K-----DQ--AVAVQHIIEEIA	3522
PLATYPUS	ETLDLMTQEI--SSIP-CMMLRWVDSMPFYL-K-----EE--AVAVQHIIEEIA	3529
TASDEVIL	ETLNLMIKEM--SSIP-CMMLRWVDSMPFYL-K-----EE--AVAVQHIIEEIA	3534
COELACANTH	ETLDLMAKMG--GSVP-CMMLRWVDSMPFYL-K-----KE--AVAVQHIIEEIA	3538
CAECILIAN	ETLDLMTREV--SSVP-CMMLRWVDSMPFYL-K-----KE--AVAVQHIIEEIA	3541
CANARY	ETLGLVTQEL--SSVP-CMMLRWVDSMPFYL-K-----DE--AVAVQHIIEEIA	3530
OSTRICH	ETLGLVTREL--SSVP-CMMLRWVDSMPFYL-K-----DE--AVAVQHIIEEIA	3500
GECKO	ETLGLMAQEI--SSVP-CMMLRWVDSMPFYL-K-----EE--ALAVQHIIEEIA	3540
TURTLE	ETLGLMAREI--SSVP-CMMLRWVDSMPFYL-K-----EE--AVAVQHIIEEIA	3539
ALLIGATOR	ETLSLMAQEI--STVP-CMMLRWVDSMPFYL-K-----DE--AVAVQHIIEEIA	3497
APLYSIA	-VVDVFNKVK--TEVP-SMMLRWVDSMPFYL-K-----PE--ADIVEPVLTKIA	3560
TRICHOPLAX	-TIDGFMRKS--SALP-SMMLRWVDSMPFYL-K-----PE--ARAVQHIIEEIA	3513
SOFTCORAL	GDIEAFKRS--SDVP-CMMLRWVDSMPFYL-K-----RE--SHAVQVILLQDIA	3536
STONYCORAL	-TLEAFVKA--ADVP-CMMLRWVDSMPFYL-K-----PE--GKAVHGVISEIA	3551
SEA ANEMONE	-TLDSFVKV--ETVP-CMMLRWVDSMPFYL-K-----KE--ARAVHGVIVTEIA	3512
SEA CUCUR	-TLKDFIKET--SSVP-CMMLRWVDSMPFYL-K-----PE--ADGVAGIVKRIA	3532
LANCELET	-TMDLFIKRV--SHVP-SMLCISWLGOMVAILD-K-----PE--AVAVHGVILTRIA	3556
STARFISH	-TMQLMIKEV--SDVP-CMMLRWVDSMPFYL-K-----PE--GPAVHGVILTRIA	3567
SEA_URCHIN	-TMQSLVKA--STIP-SMMLRWVDSMPFYL-K-----PE--SLAVQVILLKRIA	3558

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	KKYPAQVYQNVYQTRKEFKP---DSEA---SKMFDKIQCIIPKNY-----AFI	3415
TETRAHYMENA	KNYPAQLIQNTIFSNQTTCTET---ALS---QEIYEAALHKEMPHYV-----NFM	3774
STYLONCHEIA	KKYPAALYVFKVVESENKVNVL---DSD---VQKQQLFOKLSKYYERTFRNLNAWA	3655
APHANOMYCEsa	KEYPAQLYDPRLSASIPDMAA-----NARFHRLAAL-----QDHTLNOQV	3220
APHANOMYCEse	AEYPAQLYDPRLSQESIIDIET-----NPRFHRLSAAL-----RDVHLDOQV	3145
PYTHIUM	TEYPAQLFDVKTICAGE---T-----KTDIRRLTTL-----SNPVMEKPV	3443
PLASMOPARA	ERYPAQLFDVMTCKSSRDI-F-----KVDLRRLEVL-----ANPVMEKPV	3407
BREMIA	EKYPALFDVMTCKSSLNK-F-----DVDLHRLEVL-----TNSVMEKPV	3390
AEDDES	TSYPMALYPAKMSLQRHQLRPD-----NVS-SPFANRMQL-----DIPKLDRFV	3454
MIDGE	TKYPAALYVPELSEFNHNKITT-----RMK-ENV-FKIRET-----SNPTIDMPF	3470
BOMBUS	ETYPALVITFRDMETNPALLN-----ET---STYEROLLYN---R-PEIDRFL	3311
ANT	ETYPALVITYLIERNSFLQ-----NE---EIQERKLLQD---KAEYERFL	3374
WHIPWORM	DDYPAQLIHPLSLAVSLKGSSTL-----CY---RKLMELEANL-H---GSEVVHEPT	3416
TRICHINELLA	DDYPAQLIHPLLMKSATGDVG-----ETDFYRLQLKL-R---KTKIVKEFI	3420
BEEFLE	TTYPAALMVARLSKENYKCEQR-----EA---KELIETLDEL-L---TDEGANKPL	3269
BARNACLE	EQYPAALVPLAASRADRGAVRP-----AE-MSACLEQAHQL-A---NCRLEPERLV	3333
THRIP	ETYPALVYPTNISKEKNSSSTV-----KLDVIKLDRLI-E---DSSFQIPLV	3354
FLEA	ESYPAQLHYPRLSILANXKCLAG-----SYA-EYCVAKLKQVL-M---KNSLIDRFI	3373
WHITEFLY	EKYPALVYPTNISKEKQAKVSS-----ST-QTIVDSLGLTL-D---CDYGTKEFL	3444
TICK	SDYPAALVAVRVSNEAYSFDIP-----ETK--DFILRLKQKM-D---KPLVSEFI	3384
TERMITE	ETYPALSLIAPQLSREKYNLESG-----HVSLKALVDQLASL-F---TDPVIDIPL	3446
DAPHNIA	KQHPVHVKIPGLRSSLGVEVL-----A---QSETRLESK-----LTDLTWEMFL	3164
OSTREOCOCCUS	SKYPAALVPHNMKKEI-----N---RDISERISAL-----ASSLHDFI	3387
STENTOR	TKYPAALVYPTNISKEKSLSGP---TK---VK---RKFSLKRLI-E-EKFDQDFLDMFI	3089
KLEBSORMIDIUM	EEYPAALVPTREVPAPF---GD-----VA---REFTSNARLI-E---HNPLLDQVF	3715
CLUBMOSS	QHPYALVYPTNHSKDYQ---GT-----VG---LDRTRKLAATL-----KSPLEFGLV	3342
MOSS	KSYPAALVYPTNHSKDYQ---GA-----IG---RQRTQHLKILL-----RNPILLEGLV	3499
LIVERWORT	KLYPAALVYPTNHSKDYQ---GP-----QG---RRKTRRLATL-----KSVLEGMV	3553
LIGNANO	DIYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3846
COPEPOD	EDYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3352
GLOBOSUM	TKYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3335
PALUSTRIS	RDYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3398
NEOCALLIMASTIX	LSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3501
GLOMUS	EKYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3517
LOBOSPOR	LQYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3491
SYNCEPHALASTRUM	KSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3479
FUNCTIVORUM	EKYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3436
HALBUM	SNYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3595
DPURPUREUM	KYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3602
VIOLACEUM	KYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3594
AMPHIPOD	EEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3556
SHRIMP	AEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3518
MUDCRAB	LEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3511
TARDIGRADE	SEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3542
HYDRA	KSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3415
SALPINGOECA	SSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3637
SPIDER	LYYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3531
LIMULUS	KEYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3599
SCORPION	TYYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3554
ROTIFFER	TEYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3510
CIONA	RDPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3573
OCTOPOUS	CQYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3483
CAPITELLA	DIYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3529
LIMPET	TEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3521
SCALLOP	TMYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3588
LINGULA	REYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3542
OYSTER	ETYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3542
SNAIL	TEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3551
SPONGE	DTYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3591
PRIAPIULA	ESYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3591
DANTO	ECYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3567
ESHARK	DSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3590
BSHARK	DSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3580
XENOPUS	ENYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3589
STERLET	EYYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3594
GAR	ESYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3591
HUMAN	DNYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3572
PLATYPUS	DNYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3579
TASDEVIL	DNYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3584
COELACANTH	ESYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3588
CAECILIAN	DAYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3591
CANARY	NTYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3580
OSTRICH	NTYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3550
GECKO	NSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3590
TURTLE	NSYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3589
ALLIGATOR	HNYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3547
APLYSIA	AEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3609
TRICHOPLAX	DEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3562
SOFTCORAL	KHYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3585
STONYCORAL	KRYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3600
SEA ANEMONE	KNYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3561
SEACUCIE	VEYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3581
LANCELET	QYYPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3607
STARFISH	YEPALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3617
SEA_URCHIN	KDYPAALVYPTNHSKDYQFETG---DSGA---RQAERLWRL-RR---LPLVEEPI	3608

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	EALNQITHPHHRLLAYLNQIKDENSEDID-----	3443
TETRAHYMENA	YHLNQITHPHHRLLVYLYLKSQFLSFQKIHNNTYS--SQKDYVVKLNKAVE-----	3822
STYLNONCHIA	EALDCLVYPEHRFKYWLQIINDIVSD-----	3691
APHANOMYCEsa	AALLEGHHPERIRKKEALRYLSDVVD-----DKK--PKAQLASI-----	3256
APHANOMYCEse	AALHGLHHPERIRKKEALRYLSDVVE-----SKP--AKEASKI-----	3180
PYTHIUM	AALRLTHHPERIRKKEGLREVSKLLE-----SGK--AS-EAKAK-----	3478
PLASMOPARA	AALGLTHHPERIRKKEGLRKIANLLD-----ENR--TS-DARQT-----	3442
BREMLIA	AALRLTHHPERIRKKEGLKEISELVE-----DNR--TQ-DARHK-----	3425
AEDES	SELQVIVPSMKISKIITDLRMARC-----	3484
MIDGE	KCLQCLVVPKMIIDAHFKDFEFIE-----SKL--PEMNT-----	3503
BOMBUS	TALHYVVKPELYLRHYLLELRKNLS-----LGT--ATAID--IF-----	3346
ANT	QALQYVQEKLYLKYLDNAIKDLS-----QK--MTAK--SL-----	3409
WHIPWORM	KSLVLLSHPDVMLADAEPELECVTL-----GHA--HEMPLEKLGREM-----	3457
TRICHINELLA	DALNLLSHPDIAHIDELESIILNLS-----NNS-----NEARKEA-----	3455
BEEBLE	KALSGFIGPAALLIYYVRKIVKLLIA-----SSE--LGQAK-----	3302
BARNACLE	AELGRIGVY-----	3358
THRIP	KALSCLYPSSIILKDYTNKLTTEAMK-----SAP--INWLSLKEICDEFYSYHKESG-----	3403
FLA	EALSCICLPEILLNALGKLTDKNY-----TDM--KN-----	3403
WHITEFLY	KAMACLCLEDVVKLSFLGRKLTSL-----AND--GKCAV-----	3477
TICK	EALELQFPDVAFKQWCESMREALN-----NQK--SVDVR-----	3417
TERMITE	RAFSCLGQRKMLYHFVVEKLEQLLN-----AKR--P-----	3475
DAPHNIA	KSDYLYKPPKAAARQLLNSEY-----	3192
OSTREOCOCCUS	RALELHFFPANRLKFWRQQLYLREC-----QH-----DKYSNCLN-----	3422
STENTOR	EALDLYTYPEHRKKSFLDLIKDSIM-----QN-----SSSYLTYL-----	3125
KLEBSORMIDIUM	TALSDLSHPHLKQWLSSEISRLQ-----KR-----DNQQAQEA-----	3750
CLUBMOSS	RALEDLTFPEKRLDGLCEVKSCLM-----SG-----NRTKARPT-----	3377
MOSS	RALEDLTFPQORLKDGLLQILNPLF-----TN-----DSERAQLV-----	3534
LIVERWORT	RGLEDLTFPEQRFKDLGSMKNCLI-----AG-----DKERALAV-----	3588
LIGNANO	AQMGEVCLPACTALDWLSSAKRSIG-----FPS-----QTERLREL-----	3879
COPEPOD	QGLGLVFPSSVALINDLLKSCKEQSN-----FPS--YWMQAKAKE-----	3390
GLOBOSUM	VELRRLLEDPAHIFKDLCERFESLIS-----SSLP--AKQASIKKA-----	3373
PALUSTRIS	FELQRLTEPMHIFKDWLERTDSLIR-----SGRP--DKEAAIVAA-----	3436
NEOCALLIMASTIX	MELQRLSEPIHIKYDYAEKIAEVLIS-----SKEKSSKIKENLKEY-----	3541
GLOMUS	TELHRLTDREIHFKNWINPVYLVK-----RNYSGVDTAEIKAS-----	3557
LOBOSPOR	FELRRLTNPDIHLKDWLEQTVLALFQ-----NKTR--NVEQIMAL-----	3528
SYNCEPHALASTRUM	TELLRLTNPDQLKDFVDFLRSVAM-----NTEP--DKEYIQAM-----	3516
FUNCTIVORUM	SSLQKLTPEHRKQWGEILKSLK-----ASK--RSQQAIKST-----	3473
HALBUM	SEFERLTHPEHRKYDMEVTRTKMMK-----STP--INTSEIQKL-----	3632
DPURPUREUM	TEFARLTHPEHRKDFMEEMKSLIK-----SPT--KDISAISIL-----	3639
PVIOLACEUM	QEFRLTHPEHRKDYMEEMKALLK-----MAP--INSQLICKL-----	3631
AMPHIPOD	EAITLTVTEPFGDVVDRNAERLPS-----SQ--SKANKLKYI-----	3592
SHRIMP	SAMSLMVVPSIACKDAIQNLQEKD-----KQ--KMEEGLSEI-----	3554
MUDCRAB	TAMSLIVVPENTLKKSKFKILLKLN-----KE--DIEVALNNL-----	3547
TARDIGRADE	RHLTRLCEPHTFKDFDKRADYLLK-----YK--KKDQKQE-----	3577
HYDRA	KALYQLSDPVSLLKDFLEQIRGVYS-----N--GSKDEIRCK-----	3450
SALPINGOECA	TELKCLTNPVMAYMDWLEEQDAIK-----K--RDQALLTA-----	3672
SPIDER	TALDHLVSPSVIFKDYVNELVQSVS-----AK--TSADKVKEI-----	3567
LIMULUS	KALGHLGVPPYGVFKETCRNITSLKK-----FK--ENSEKQKE-----	3635
SCORPION	NALDLSVPELLKRYFKLILQMKK-----DK--GDKNEIVKL-----	3590
ROTIFFER	TALDHLNPKFLKQWLDMDNNLK-----	3543
CIONA	RQLRRRICHRSIAEKDWKEDFTNLFCSS-----KET--SRMKHIVEN-----	3611
OCTOPLUS	SSLESFAEPLNFKDFKFNALQLYS-----KTN--PKKQEVIEL-----	3520
CAPITELLA	FSLEMMHEPAVILKDWIMDMKNAKG-----PGGSSQSLSMAYVKER-----	3570
LIMPET	SALDQFGQPEMLFKDWTDDIKKMLQ-----SKN--RNKSKIMEK-----	3558
SCALLOP	CALEQFGQPDQIFKDWGNDMLRMLK-----KKK--QDKVKIKEL-----	3625
LINGULA	NALEQFGQPNALFKDWGEMAKLLH-----VKQ--RNTDAVQR-----	3579
OYSTER	SALEHMSQPDQIFKDWFDTRLKFM-----KNK--PDKAMKEE-----	3579
SNAIL	SALEQFSQPVQMFQDWSRDTIKLLE-----KR--P-AAEIKKK-----	3586
SPONGE	AALQOLNSPELAWKDYDNLKPLV-----GSVTVPK--RDKNAIKRV-----	3632
PRIAPULA	ASLEQLSSPHMLKDFVADARPLLM-----T--LRADFPAR-----	3625
DANTIO	DALQOLSNPEMLFKDWDEVKNLQD-----KPN--LDKMKMLQ-----	3604
ESHARK	HSLEQLSNPMLFKDWVDFRSKLE-----KKE--ANKQKLN-----	3626
BHARK	HSLEQFSNDLLKDWMANDFKTELE-----KKV--KDKKLLKNN-----	3617
XENOPUS	RALEQLSNPPMIFKDWVEDVSNELS-----KPN--VNNKNIKEL-----	3626
STERLET	DALQOLSNPEMLFKDWVEDVKKLE-----KPK--TDKLLKNN-----	3631
GAR	EALQOLSNPEMLFKDWLEDARNTLS-----KPK--TDKDAKMM-----	3628
HUMAN	NALDQLSNPELLFKDWSNDVRAELA-----KTP--VNNKNIKEM-----	3609
PLATYPUS	QALEQLSNPEMLFKDWVEDIKIELT-----KTP--INKNLKRMM-----	3616
TASDEVIL	NALEQLSNPELLFKDWVDDVRGILLM-----QTP--VNNKLEKMM-----	3621
COELACANTH	HALEQLTNSDMIKDWVDDVRNELD-----KPQ--RNKANLKRMM-----	3625
CAECILIAN	QSLQOLSNPDMIKDWIEDMKNELA-----KSQ--RNKNNIKLL-----	3628
CANARY	HSLEQLSNPVMIFKDWAEDEVNELS-----KPQ--RNKKLKEM-----	3617
OSTRICH	HSLEQLSNPMLFKDWTEDEVRELIV-----KTQ--RNKNLQDM-----	3587
GECKO	QALEQLSNPMLFKDWTDHMKELG-----KTK--RNKNLKL-----	3627
TURTLE	HALEQLSNPVMIFKDWVEDVKNELG-----KTQ--RNKNLKRMM-----	3626
ALLIGATOR	QALEQLSNPEMLFKDWVDAVRNELG-----KAQ--KNKAKLKEM-----	3584
APLYSIA	SALEQFEEDIVFKDWGKEMRLLN-----AQK--RDGKIKKV-----	3646
TRICHOPLAX	RALEQLSQPDVLFKDWVEVKGLK-----KSG--SIAESIRIC-----	3599
SOFTCORAL	QALEQLTNPENVFKDWMEVVKVLLS-----TK--GNAVKIRE-----	3621
STONYCORAL	AALQMLTNPENVFRDWCCEGPMKQLLE-----DQIKR--NDSQAVKQC-----	3640
SEA ANEMONE	AALQOLHNPMAFKDWCDGGEIKQLL-----QT--KNKAIKEA-----	3597
SEACUCIE	RALEQLNHPGVLFKDWADDELKPL-----QAEK--RDNVKIKKA-----	3619
LANCELET	GGLEQLSHEDQLFKDWGDADLKRLLKVDPKKRTK-----EDKVTIKRL-----	3651
STARFISH	CALEQLNPEFVFKDWADVMKPLL-----NVAK--RDNKNIRQA-----	3655
SEA_URCHIN	LALQRLTHGFIKDWISVIN-SKM-----NSKE--RDHPAIKQE-----	3645

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	----TVIDKI----QEDF-FS-----KREDFYGSYNLA---	3467
TETRAHYMENA	---EVQKIDRLRLKETEEDL-FQH-----NINADHMGSYNIK---	3855
STYLONCHEIA	---LKDI--IMMAYDLTC-TQK-----DLGQVGSYNRK---	3721
APHANOMYCESa	-----VSTTLSAV-FDDRTRV-----LGNQVQAYNRQ---	3282
APHANOMYCESa	-----LAATISHV-LDESSKI-----LGNQIGVYNRQ---	3206
PYTHIUM	-----MAHVQDC-FASEHPL-----LGGQIGHYNRD---	3504
PLASMOPARA	-----VELLRDC-FSPQRQL-----LGAQIGRYNRE---	3468
BREMIA	-----VTRLWKDC-FSLDRPL-----LGGQIGRYNRE---	3451
AEDES	---YRKLVHDLANEA---F-----PEISPDLGREHQKLP---	3513
MIDGE	---KMFQDAVKVYKVV---F-----ENNENLKGTSFSIHE---	3534
BOMBUS	LKRVYPNLREN---K-H---D-----PKPGLIFNK-LASYKN---	3375
ANT	LEKVYPNSHTHAEB---K---N-----PQGOIFGKEIASYEB---	3442
WHIPWORM	IAKISARLLSDYK---P-----DALGTWVK---	3480
TRICHEINELLA	IAKVYSPVTFADIR---R-----DFLGSFWKCY---	3480
BEEBLE	---IVHDFVLKEMPI-KADS-----RSDLLQGNMFKSITK---	3334
BARNAACLE	---KAAGALADWGLAVAL-SDPP-----SEADRQLRLCGDNGE---	3394
THRIP	GPSQCAGNFFHSYKHKHEH-----IPALFDELCAASE---	3436
FLA	-----LKRML-F-Q-----QNLHPLRGAFAEAMTK---	3426
WHITTEFLY	---CIGAVLEIFDEAEI---K-----GNIYSLIGDLKKDVIE---	3508
TICK	---KLYADGVRLFGQGRDL-A-L-----SSGGIVHRHFSDVVK---	3453
TERMITE	---NCDSLHHMYDTMMKEL-F-P-----SSYGIHGALFKDIE---	3509
DAPHNIA	-----FQSKYLANL---PPPT-----ARSAGHVHYS---	3215
OSTREOCOCCUS	-----LEVMLLDL-AVV-----DDPLLGPINRK---	3444
STENTOR	-----FNEHEKSI-IG-----TKMPGVYNNK---	3145
KLEBSORMIDIUM	-----FREMTRDC-LDARLAA-----AERQAGODLLA---	3777
CLUBMOSS	-----FRAVPADC-LDVEAMRN-----ETROAGEYNNK---	3404
MOSS	-----FNEIYQDC-LDTQSLKD-----PVRQTGEYNLK---	3561
LIVERWORT	-----FAEIIYEDC-LNVNVMRK-----SLRGAAGEYNLK---	3615
LIGNANO	-----HAEAIDQLFFDPD-----GPOAGSHGRLRRE---	3905
COPEPOD	-----YKDFKVRV-LSK-----DPDVESAFKT---	3411
GLOBOSUM	-----YEEFKLIC-LET-----K-KNGDIGRK---	3393
PALUSTRIS	-----FEEMAAYC-LTQ-----NSDMGEVGRA---	3457
NEOCALLIMASTIX	-----SNVIEHYL-IEPP-----S-NKAGTIYMK---	3563
GLOMUS	-----FQKMSSFL-LKP-----NPYHGIFAKE---	3578
LOBOSPOR	-----YQDLHRLV-LD-V-----GNPKLGSIAKA---	3550
SYNCEPHALASTRUM	-----YRQFSELL-LSPT-----SSNRYGVIKPA---	3539
FUNCTIVORUM	-----FAEIIYALD-LDS-----TDETIGSYNNK---	3495
HALBUM	-----GVEIYNDC-FNP-----HTVRGDYNLK---	3653
DPURPUREUM	-----NSEIYDSD-FNP-----KTVSGDYNIK---	3660
PVIOLACEUM	-----GTEIYNDC-FNQ-----KTVKGEYNLK---	3652
AMPHIPOD	-----KEQFFANV-TSLALQQ-----QETORGAQYYL---	3618
SHRIMP	-----VSEFLK-V-QNRSSKG-----NAEEKGEAYTRQDR---	3582
MUDCRAB	-----VADHLK-V-NNRSTRG-----MAGEKGEVFCVKVK---	3575
TARDIGRADE	-----YAEINQCV-FRQG-----SSTQLAATWKE---	3600
HYDRA	-----YKSINDLL-LSANSRQS-----SESLKGRVPIE---	3478
SALPINGOBECA	-----FKHLKSEL-LVTSSTTA-----SDREVGSAWKA---	3699
SPIDER	-----FTRINDKL-FNPNAAEK-----NRRVTVGPLHKK---	3595
LIMULUS	-----FQEMWQDI-FDAGNQDN-----S-GPGKGLVFIN---	3662
SCORPION	-----YKALCHEL-FNINPRDK-----M-KERK-LHLK---	3615
ROTIFFER	-----FKOLNNL-IDLE-----GKIDFCGRMTD---	3567
CLIONA	-----YQNMNFDF-FQCIPPASEE-SSLY-----GDSPTSISVGLIWTK---	3649
OCTOPUS	-----YKDMCSSL-FEE-----NVSPYQK---	3539
CAPITELLA	-----YQELYKEL-LCIESEDGS-----LYSDSADCSMGPYRSD---	3603
LIMPET	-----YKEIYNML-IEYKETQDTSSTQL-SY-----MTQTTNVGMGEYRKK---	3597
SCALLOP	-----YQEMYRQL-LEPSQGT-LSSQOD-DVFSTQTSQSIIEMGQYLRK---	3667
LINGULA	-----YTQMYSSL-MMTQORQA---GGVSQ-DI-----FDTEPDSVEIGQYRQK---	3617
OYSTER	-----YQIMYKVV-LEFTETVGRGASQR-SQ-----TEETLSMVDKGYPKK---	3619
SNAIL	-----YKEIYDML-LEMPHKGEQSQTQ-A---QQTSPFGAVSMGEFHRR---	3624
SPONGE	-----WEQMYSQL-LETRSGLGD---KSLYG-----GSPSLQKARQKT---	3667
PRIAPULA	-----FRKIYASL-FDTTRRSQE-----EPGGRGRYWSV---	3653
DANTO	-----Y-MTELL-GDA-----KSPRFGSYRKK---	3624
ESHARK	-----YSEMYSNL-AVA-----GAPGIGAFRRR---	3648
BSHARK	-----YDEMYSNL-ASL-----QFPGIGAFRTR---	3639
XENOPUS	-----YKEMYTNL-GNP-----KDFMGAFRRR---	3648
STERLET	-----YEEMYSAL-GNP-----RCQIGAFRKK---	3653
GAR	-----YEEIISVL-GNA-----KAAGIGFRKK---	3650
HUMAN	-----YERMYAAL-GDP-----KAPGLGAFRRK---	3631
PLATYPUS	-----YEGMYKTL-GNL-----KAPGLGAFRRK---	3638
TASDEVIL	-----YEEMYAIL-GTL-----EVPGIGAFRKK---	3643
COELACANTH	-----YEEMYANL-GNL-----RAPGLGSFRSN---	3647
CAECILIAN	-----YEEMYMNL-GNL-----KAPGIGEFRRR---	3650
CANARY	-----YERMYKNL-GNL-----ESPLGMRRKR---	3639
OSTRICH	-----YERMYRNL-GNL-----EAPGLGLRRR---	3609
GECKO	-----YDGMYNL-GNV-----HASGLGLFRKR---	3649
TURTLE	-----YEGMYRNL-GDL-----QAPGLGLFRKR---	3648
ALLIGATOR	-----YEGMYGNL-GNL-----QASGLGLFRRR---	3606
APLYSIA	-----YLELYQSL-LEOPASGRQDSGGS---QASVSSVTSVPMGEVRRG---	3687
TRICHOPLAX	-----YQKLRDGL-LVDASNESEAA---SSLTSGELIEFGSHKRR---	3635
SOFTCORAL	-----YGEMSKKL-LNVKKRGT-----NSDGLFEGSIRRK---	3650
STONYCORAL	-----FGAMFQLL-MDCRKRKSGS-----QTRGTESGPFRTK---	3672
SEA ANEMONE	-----FRSIYQQL-FDSSVNR-----ATDSSQPAEEMGPFRRK---	3630
SEACUKE	-----YSQMEDKL-LNFSWSYEGHD-----LCGIVANFRTS---	3650
LANCELET	-----YDEMYDSL-LDFRSASQDSMSLFGSQSDLESQVGPFRRR---	3695
STARFISH	-----CHEIYMNL-INHRSTVTDGAG---SSQDSQSSPSVGFGNFRRR---	3695
SEA_URCHIN	-----YQQLYQQL-FES---GGR---QGGPSSSSQTVPEGPPYWK---	3678

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	FIQKKKQNLN---QILKNKADS-----HTINQFA-QEISE---E-----AK	3501
TETRAHYMENA	FSKDHISEFK---KLVKKPTDITKG-DDQD-KREAYDFI-KKFRDK--VN-----TK	3899
STYLONCHEIA	FAELWDKVF---KEFGS--NLNRV-DKMS-NSEIKSV-QNLNKNLQNS-----IG	3765
APHANOMYCEsa	WMAQHRKHIE---AMLG--KDV---TKAA-LQSARGWL-SQTFQVMPG-----KY	3322
APHANOMYCEse	WITKNRQIE---SMLG--KHGELA-NKST-LQTAAGWL-SQSFOVMPG-----KY	3249
PYTHIUM	WAKRAKRDVE---KMLG--RDGSNV-TAKS-VNAAREWI-MNHFSVMPG-----KF	3547
PLASMOPARA	WSRVAKRDEVE---KIMG--KDGLKM-TAKT-VSAAREWI-MNHFSVTPG-----RY	3511
BREMIA	WSRKAARDVE---KIMG--KDGSKM-TAKS-IKYAREWI-MKHFGVTPG-----TY	3494
AEDIS	LKPEWL-----KLLDF-----DFNQTSEEIHQ-HL--NNLKEKV-----TR	3545
MIDGE	FKAKIR-----EVPNM-----KWNQKTKSFLHEL--RFQIEKL-----GK	3567
BOMBUS	MIKELN-----KRTBEIK--LCVDRITERIKS--LI-----	3404
ANT	KIRALAH-----EDLDAAR--KEILKKEPLINES--LWK-HMN-----KN	3477
WHIPWORM	---YKPT---LBQLFNEQITSLD-ATWLEVTKRSMTEV--IEEAK-----RM	3518
TRICHINELLA	FKKYLK---MQEIFSVLDCAPD-NKAAENYLRLCSSP--LSELR-----TF	3521
BEEBLE	YEKDLN---IGRLLTKPSETPNVLKQLQKIN---T--NLGNTLQ-----DR	3373
BARNACLE	RITTRSA-----PKAV-----D--LIK-----KR	3411
THRIP	RNTTVAS-----EILNK-V-KKT-----LEKVKE-----LD	3460
FLAFA	FENLFST-----YM-----EKPSPEL--LMEIKML-----LK	3451
WHITEFLY	LKKYVDR-----GKLKEAL-KQTENIMRAITPC--YHK-----	3538
TICK	KKVTDAP-----GIEGSKL-VKM-DAKKPGSEC--QVI-----LK	3484
TERMITE	YRKR--L-----EKAESNI-KCG-NKKVLKDIC--FIKEKLEK-----YI	3542
DAPHNIA	FSQAFYKGFQ---ETLD--Q-G---RMK-----SLLNSLEFF-----K	3244
OSTREOCOCCLUS	FVEIASPILN---SVYK---SALK-EKMS-VSETLKKVVEVQLDE--WRKEPH-----	3487
STENTOR	FAYDMEPTLS---GFG--RQFTNI-NRMS-TTELLQAT-ETLAKKLAN-----	3186
CLIBSORMIDIUM	YARNPESKIV---SALG--KDGVKL-ARMS-ATEYKNAI--SSVSHVLDLDR-----ED	3820
CLUMBOSS	FARDYSKPVV---KALG--EDGSKL-LQMD-EKKPATAI-AGVLTSLQK-----AI	3447
MOSS	FARDWASLIV---KELG--LNGSKL-RSMD-AKQFSSVI--SGLFEKLSK-----ND	3604
LIVERWORT	FGRDWSKRVI---KALG--ENGSKL-VKMD-EKKFMSAV-GDLLANLQK-----AM	3658
LIGNANO	FAARHRREFL---AALP---TADRL-VGIRSEAEQLRAV-GKLWKRVRD-----ER	3948
COPEPOD	LEKTFGAKLD---KAFA---GSKL-LQDL---KEIY-KEADA-----KF	3444
GLOBOSUM	PAEKHTAKIA---NICA---NGEKI-DNNK-LKE-----LVS--YRDK-LGS--E	3430
PALUSTRIS	PASKHAAKLF---KILG--KDGSKL-TNIK-LSEW-----KEIQK--YHQPIHG--K	3499
NEOCALLIMASTIX	FSKKYKNEK---KVFA--LSNLV---KAK-PKTYMNI-F-KKQLTT--FRSD---KEF	3606
GLOMUS	FVNRHSEYLF---DICG--RDGSIL-ARMS-PNDF-----KSKIYD--YIYKNIKRO-D	3622
LOBOSPOR	FAKYGSKME---SLCG--KTGQKL-ATIS-NRDF-----NSHILK--PCRNEILSKDA	3595
SYMBIOPHALASTRUM	FATKHAQSLR---GLFG--KDGSKL-LMT-QRDL---KRI-QD---YQR-----NVK	3578
FUNGIVORUM	FATTWSRKYV---SAFG--KDGANL-CKMT-AEDLQSHL-SEPLEPMNR-----DL	3538
HALBUM	PAKEWHDHYS---QHSF--KDGSKL-AKMD-VKKLVELV-ADMSGKMAK-----TM	3696
DPURPUREUM	PAKEWEDKYL---KYYG--KDITIL-SRMD-QKKPLEHF-AEMSEMNMK-----NM	3703
PVIOLACEUM	FAKEWEAKFI---QHFQ--ADGSKT-LKMD-VKKLVEVV-GEMSANMNM-----AM	3695
AMPHIPOD	ILDKLKLVPK---KYFG--DKGSEM-KSLK-CTEIDRCI-TELLSC-----	3656
SHRIMP	AKKQMAEAF---KAFG--ENLKA-KSL-IRDQREL-GSMGRVLQ-----SP	3625
MUDCRAB	LKRDVNVALT---KEFG--GKMEEF-KRMP-VVEIKKRL-NSIRTVVNO-----	3616
TARDIGRADE	FVEKPKQDFV---YLFQ--ENGQKI-ANLS-SSQWAKTK-EKWENDPK--EYKG--KA	3646
HYDRA	FAKKFSSYVE---SLFG--KDGSKL-LKMS-LNEFQEAT-QQINEKLE-----	3519
SALPINGOCEA	AAKKASRNFM---DQFG--TDGSKL-LRMD-AKAYAKVK-KVLKAKLRE-----	3740
SPIDER	FSEEPKDFL---ATCG--KDGCKL-MKEK-ESKVALKALSDLVAEAK-----	3637
LIMULUS	FEKKFKKVV---DLCG--QNGNRI-LSMS--TRKFSKES-NRLVEEMKKT-----	3704
SCORPION	VAKVCGSVF---SFG--KGNKLI-TSMP-LKEASVKY-ETLLKTTM-----	3657
ROTTIFER	FSNFIKPLFM---KQFG--EQFRLI-POLS-ELEIKNKL-QNICSVNEF-----	3609
CIONA	FSKNYKAKVE---RTFG--QGTGDKL-SRMD-LKQCRGEI-NNLYSDIEK-----	3691
OCTOPUS	PTENFHSLFV---NSFG--KDGSKI-NKMN-KQELQKQI-LVVKEKLE-----	3579
CAPITELLA	FVKQFISQFD---EYFG--KMGSKI-PGLT-FMKVLSWL-SDKSE-----K--V--KK	3644
LIMPET	FADTFKDFD---IAFG--KNGEKL-ASMS-IK-----	3625
SCALLOP	FSARFKDID---KYFG--EDGRKL-VGML-LKDFGIF-RKLGEDMDHEVRG--I--PK	3715
LINGULA	PAKAYCKDL---SAFG--KDGSKI-MTMS-EAADGIF-KKMDLASKGT-----RG	3661
OYSTER	FAERFKDID---SCFG--KNGEKL-LDMS-FSKLAGAY-KKVKMDMDFE-----VK	3663
SNAIL	FAEVFKNEFD---NHFG--VDGSKL-VTMT-AKEFSGIL-RNLQ---AQFE-----KH	3666
SPONGE	FAQAYAKNIE---DKFG--KGGAKI-ISMS-GTQLASAF-NEVYNKMRSE-----	3709
PRIAPULA	FTRTWAREVE---EKCG--RDGSKL-LAMA-AADANQVL-SALGEMK-----	3693
DANIO	FIQKFSKEVE---KLLG--AGGSKL-YERRKDKDFLQV-DRMVQSM-----	3664
ESHARK	FVTFKPKKID---QHFQ--KDGSKL-LNMM-LKAPNVAV-QQIMET-----	3686
BSHARK	YVQVFKKAFD---QYFG--KEGSKL-LDMN-IKIPDEMT-KKILETV-----C	3679
XENOPUS	FCEKYTKDFD---KAFG--PEGSKL-LNIK-CDGPNKTV-GPLITKM-----	3687
STERLET	FAQHSKFEFD---KTFG--KGGAKL-FDMK-HDAFRKAS-DSLWGSISEE-----	3695
GAR	FVETYAKRIEIVKELG--KDGSKL-WDKR-KD-----EKFWKLTTS-----I--RS	3692
HUMAN	FIQTFGKEFD---KHFG--KGGSKL-LRML-LSDFNIDT-NMLLLK-----	3670
PLATYPUS	FIQAFGNEFD---HHFG--KGGSKL-LQMK-LSDFTSIT-NSLSK-----	3677
TASDEVIL	FIQTYGKEFD---RHFG--KRGSKL-LVMK-LSDFNIT-TLLANK-----	3682
COELACANTH	FVKAYGKEPE---RVYQ--KRGSKL-LDMK-SSDFPKVS-DQLLTS-----	3686
CAECILIAN	FVQAHAKDL---THFG--KGGSKL-VDMK-EDAFKTA-YSLFNNM-----	3689
CANARY	FIQAFGKDL---HHFG--RGGSEL-LMMK-TSDFDAIA-NSLSK-----	3678
OSTRICH	FIQAFGKDFD---HQFG--KRGSKL-LMMK-ASDFDAIT-SALLSK-----	3648
GECKO	FIEKFGKEFD---SHFG--KRGSKL-LDMK-ASDFDAIA-DSLLK-----	3688
TURTLE	FVTFGKDFD---SHFG--KRGSKL-LDMK-ADDPNRIA-FSLLSK-----	3687
ALLIGATOR	FIQAYGKEFD---TQFG--KGGSKL-LDMK-DNEPIKIV-NALLAK-----	3645
APLYSIA	FATSCAEPD---KAFG--KNGDKL-TSMN-VKEPQSMV-RKINEVINKH-----K	3730
TRICHOPLAX	FIQHFQKVE---QYFG--KDGSKL-QSMK-ASDFEKIA-SRLIQEIS-----	3675
SOFTCORAL	FAQEFSGNVV---KVCG--EDGSKI-IDMS-IKAFESAM-KTINEK-----	3688
STONYCORAL	FAQEFANEVQ---RIFG--KEGEKL-VGVK-MTDFSKWC-RDIQQKMXF-----	3714
SEA ANEMONE	FSKEHASRFE---NIFG--KDGSKL-VNMS-LRTAKLK-----Q	3662
SEACUKE	FARKWLKVE---KVFG--KGEKEL-LKAI-TNDFTTVV-A-----NMYAEMNP--R-	3692
LANCELET	FAQQFAKECE---KMPG--KDGSKI-LDMK-EKEFMKLE-SGLQNMGMDFYKAFP--RE	3745
STARFISH	FAQEWQKFE---AAFQ--KDGTKV-IDMQ-LRTFSEHY-GKL-----YKEMAA--K-	3737
SEA URCHIN	FGREWQKRFD---SSFG--QDGSKL-AAMD-YKTSKLR-QDI-----CARMTP-----	3719

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	QIQVKNQOMIHDMSRPFQNYNEESIDQ-----VKGQTELLIPILS	3543
TETRAHYMENA	DL-KSGYDKLSNFSSLQNF-----Q-----AD--HIIELPQOYT	3932
STYLYONCHIA	NL-GQGYEKLSTFSEWLDLSDPNDFYN-----PS--EYIELPQOYE	3804
APHANOMYCEsa	GIDRHWKAKLADFSDFLAQLDPVK-----MRIELPQOYTK	3357
APHANOMYCEse	GIDRWKAKLADFSDFLQMLDPVK-----TRIELPQOYIK	3284
PYTHIUM	GITKDMKARLADFADWLEDFDHIK-----CRLELPQOYTS	3582
PLASMOPARA	GITKDMKAHLGDFAEWLEQFDHSS-----CILELPQOYTS	3546
BREMIA	GITRDMKAHLGDFAEWLEQFDHSN-----CSLELPQOYTS	3529
AEDIS	LVPRQTFLELNKYSPLAGLHFSEER-E-----EMLELPQOYNI	3582
MIDGE	HRRGTEPLEVHKLCNFAEYKWCGE-N-----DFLELPQOYVQ	3604
BOMBUS	-KDDNKNRLQDYSPFLCNFP--E-----ROVELPQOYTS	3436
ANT	VITYNKLSKLDKDYSPLHKVGSSS-----DGIELPQOYTS	3513
WHIPWORM	PDISRCDALCDYSLDMFRSSTDS-G-----IHLIELPQOYTS	3555
TRICHIANELLA	YIPECCPNLNKEYSPLAGRPHPM-D-----VFLIELPQOYSG	3558
BEEFLE	RENQRNSRLKEYCPLANFSASKN-N-----LELELPQOYDG	3410
BARNACLE	LAERPASRLGDFSGWLASFDQVNS-Q-----ERLELPQOYTG	3448
THRIP	SKNIKHYSKLDFSPWLAEPSSSK-N-----ICILELPQOYTG	3497
FLIEA	SLSNHRPKTLRDLCPWLAEPDQDS--VALELPQOYQG	3487
WHITEFLY	QPSRDARISLKSYSPLASFLSTAY-S-----STTEMPQOYSG	3575
TICK	SYKSLPTALKDLSPWLSRFSALDR-D-----NKILELPQOYTG	3521
TERMITE	IQDIKPPVQLKDYSPWLESEYQGGKCF-----LELELPQOYTG	3580
DAPHNIA	KKTFPGQKSLRDYSPWLANRIDDGIV-----NILELPQOYKQ	3282
OSTREOCOCCUS	GIESARLRLSDPSSWELHSS--E-----QVLEVPQOYDM	3523
STENTOR	PSLPGREKLTDFSPWLAQGLDITP-----GLDLELPQOYTG	3224
KLEBSORIDIUM	--LAHGKQLSRFSKWLADQSGAAPPARGARKLPRGTISDFTESDAGGHPVRCG	3878
CLUBMOSS	KDLPGGKLSLASFSKMANDOPRGRGS-----SSDLELPQOYDG	3489
MOSS	--ISAEKISLGLSKWLADQDTQGIERV-----SRDFKNEMOILEPQOYNG	3650
LIVERWORT	LNLTQVMSLGLHLSKWLADQDQOISTNQESLGGGGSSKAFRSSEGDIPEPQYAG	3718
LIGNANO	DSSSVATARLADFSTWLAEPAAEHDG-----AYLEVPQOYQC	3986
COPEPOD	RYPKFNPSQLKTSFSAWLANFLASD-HV-----QTVLEVPQOYTG	3481
GLOBOSUM	AESKPNKLLKFSPLWLESEYQIGN-YD-----PTEYLEVPQOYTG	3469
PALUSTRIS	EALPQGMVALKNYSPLWLTNPNARD-YN-----EELELPQOYEG	3536
NEOCALLIMASTIX	ERNETYKTQLKNYSNWLSEYQGN-YD-----RELELPQOYDG	3643
GLOMUS	RKAQEGVNLKYSYSAWLAEPSSN-VE-----KELELPQOYDG	3659
LOBOSPOR	SKKQSDADLLKAYSPWLANQASD-YD-----GVLELPQOYSG	3632
SYNCEPHALASTRUM	AESGREAGLLKYSPLWLTNQAAN-FN-----ESLEVPQOYSG	3615
FUNGIVORUM	NPKKTAKMKLVDFSSWLANEQLD-RG-----NGSSELPQOYSG	3577
HALBUM	KPSTATMKLDFSNWLEDRSN-QL-----TELELPQOYHG	3733
DPURPUREUM	RPTSTATMKLDFSYWLEDRSN-YP-----TSKOLELPQOYNG	3742
VIOLACEUM	KPTSTATMKLDFSPWLAEPDKSN-FS-----SSQEMLELPQOYSG	3734
AMPHIPOD	--WSSSLNDVKELSPWLSYQGSQ-YS-----DRILEPQOYSG	3691
SHRIMP	EEMRKLPRLLKAYSPWLANQASK-YS-----EVLELPQOYTG	3662
MUDCRAB	RRKENAPNLKAYSPWLANQASK-HS-----DVLELPQOYSG	3653
TARDIGRADE	RETLSPRGLADLNPWLAAPTSLQ-YG-----RALELPQOYDG	3683
HYDRA	--YKSIINASLDYSPWLSYQPSD-FL-----DRLELPQOYTG	3554
SALPINGOECA	YDTKPPRTLLKEYSPWLSKLRSPG-AV-----FDILEPQOYDG	3777
SPIDER	--KDKKLSLKDASPLWLEPQWK-YS-----SQLELPQOYTG	3672
LIMULUS	-CLNVGSRKLDLGLSDPWFHPFK-YQ-----DBLELPQOYTG	3740
SCORPION	--SEMKEAKLRDFSDWLESEHSLK-YS-----EFILEPQOYTG	3693
ROTIFFER	CQRKPMGSLGDYSALKGLKRNIT-T-----KFILEPQOYNG	3645
CIONA	--PTLGTSLNDYSPWLAQQLSRSS-----KELEVPQOYDG	3727
OCTOPUS	KQKLKEPKALEEFSSWLANDPL--L-----DTLELPQOYHG	3614
CAPITELLA	AFSNQPRKLLKEYSQWLAEPQAGN-HE-----ASLELPQOYTG	3681
LIMPET	RGKLVPPSLHEYSQWLAEPNPNR-DS-----RELELPQOYDG	3662
SCALLOP	NPRLLPASPKEYCKWMDVFNPNR-EG-----NNLELPQOYTG	3752
LINGULA	HPNLVPSEKLDYSKWMSGLAAQD-MD-----LSLELPQOYTG	3698
OYSTER	EKNLKPANLKYDQWLANPNPSI-QG-----KDLELPQOYDG	3700
SNAIL	KADLTPPTNIGKYCSWLANPNPNH-ES-----RELELPQOYDG	3703
SPONGE	LNKPFSSALLKDYSPWLDTRQED-YL-----QVLEVPQOYDG	3746
PRIAPULA	TKAADSPGNLKEYSTWLTDFHSSP-AT-----CQLELPQOYRG	3730
DANIO	RGFQKEPGNLKEYSPWLSYKAEF-LK-----NELEVPQOYDG	3701
ESHARK	-QKPEPGNLKEYSPWMSNKPQF-LG-----NELELPQOYDG	3722
BHARK	KKQAPPGNLKEYSPWMSKPEY-LR-----NDLELPQOYDG	3716
XENOPUS	KEQKEPGNLKEYSPWMSKPEF-LR-----NELELPQOYSG	3724
STERLET	QKKEPGNLKEYSPWMSNKPVEF-LR-----NELELPQOYDG	3732
GAR	MDSIALPGNLKEYSSWLSNRPET-LR-----NELEVPQOYDG	3729
HUMAN	NKDSKPPGNLKECSPWMSDKVEF-LR-----NELELPQOYDG	3707
PLATYPUS	KESSKPPGNLKECSPWMSDRVEF-LR-----SELELPQOYDG	3714
TASDEVIL	REDSKPPGNLKECSPWMSNKPVEF-LR-----NELEVPQOYDG	3719
COELACANTH	RKFQREPGNLKEYSPWMSQKPEF-LR-----NELELPQOYDG	3723
CAECILIAN	RGSQPEPGNLKEYSPWMSNKPVEF-LR-----HELELPQOYNG	3726
CANARY	IKTHKEPGNLKECSPWMSKAEF-LR-----SELEVPQOYDG	3715
OSTRICH	IKSHKEPGNLKECSPWMSKAEF-LR-----HELEVPQOYDG	3695
GECKO	KECHQEPGNLKECSPWMSKPEF-LK-----HELELPQOYDG	3725
TURTLE	KD-QKEPGNLKECSPWMSDKAEF-MR-----NELELPQOYDG	3723
ALLIGATOR	RDGQKEPGNLKEYSPWLSKAEF-WR-----NELELPQOYDG	3682
APLYSIA	NKROPAAANLKYDYPWMAEPNSH-NG-----RELELPQOYRG	3767
TRICHOPLAX	GKIKNRPENLKEYCPLSNQAAN-FT-----YSLEVPQOYTG	3712
SOFTCORAL	MKAKKLVGNLKYDYPWLANQVQS-ET-----IQLELPQOYSG	3725
STONYCORAL	RNRTPPPGNLKEYSPWLSRQSN-FT-----HTLELPQOYKG	3751
SEA ANEMONE	QMVSKPPGNLKEYSPWLTNQAAS-HA-----QKLEVPQOYTG	3699
SEACUKE	--GAKDPGNLKEYSPWLTNQLTE-Q-----AQLELPQOYTG	3726
LANCELET	KANCYAPGLLKYDYPWLSDNPLD-YD-----RELELPQOYTG	3782
STARFISH	--RRDPPGNLKEYSTWMSDQQLS-YD-----RELELPQOYSG	3772
SEA URCHIN	--GKDDPGNLKEYSPWLTNQLR-G-----DBLELPQOYDG	3753

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	M-----NEFDIQMTPKIASFDQGLVLSLIRKPKRIKTYGDEKQVLFVWKGEDLRL	3596
TETRAHYMENA	G----AVITPEPYKESHKIQSFDQSILILQSIIRPKRRLCIYDDEKCKKLVWKGEDLRL	3988
STYLONCHEIA	-----LKSEPLIEKNVKIASVKKTLILGSIIRPKRITVHFSDEKDVHLIKGCEDLRL	3858
APHANOMYCEsa	H-----WGPPEPATHYVILSCPEQLMVLPSKQLPKRLVLAHDERTVMVWKGCEDLRL	3411
APHANOMYCEse	R-----WAKPDPSTHYVILSCDPQLMVLPSKQLPKRLKLYVDEKTYLVWKGCEDLRL	3338
PYTHIUM	Y-----WGPDLNHHYVILSVAQGLVLSKQLPKKITFHGSDNKGKTYLVWKGCEDLRL	3636
PLASMOPARA	H-----WGPDPATHYVILSFDMSLGLVASKQLPKKLTAHGDEKKNVTLVWKGCEDLRL	3600
BREMIA	Y-----WGPDDSKHVKILSFDVSLGVLASKQLPKKLTMHGDEKETEVLWKGCEDLRL	3583
AEDDES	D-----HKPNVNCNHVKIVVCTELELFFKILRNPIRIRINGSDGKSI'DFLVKYGEDLRO	3635
MIDGE	D-----RKPFIEQHVKITVRFETRLKVFRRKQPIETIKMYGDKGSI'SFIIKYGEDLRO	3657
BOMBUS	N-----RKMPQYHAKILKFDOSNLRVWMSMRKPIRITMHSADAKDHFLLKPFEDLRO	3489
ANT	E-----KEEPPHYVIRVAFEPQVEWQSLRKPRIKISIDGDEKCKKLVWKGEDLRL	3566
WHIPWORM	D-----HKPLPEYHVTINSFGAKLQLISLIRKPKVVISIYDDEKDKHKLVWKGEDLRO	3608
TRICHNELLA	D-----RRPFPERRVHIIIGFASDIEIMRSLKPKKICIQDGRDKLVWKGEDLRO	3611
BEEFLE	E-----R1PLVQHVKISGFCPNVSDMSLRKPKITITLIDITKYE'PLVWKGEDLRO	3463
BARNACLE	R-----RRPQPDYHVRVANLSDEALVLSIIEPRVITVREDDAREYR'LKAKGDLRT	3501
THRIP	D-----QKPNPERHIMISGFNDTVLWVPSIRRPVKLTVIGDAGSHN'LVWKGEDLRO	3550
FLAFA	H-----KKPLPHYHAKIARFDQKITVLLSQRPLPKIGIYSDCKEHLV'LVWKGEDLRL	3540
WHITEFLY	K-----MRPDLKNHIMTAGFKTEVSVWQSLRRPKITMIGDGNHYS'LVWKGCEDLRO	3628
TICK	R-----SKMPPEYHVNIFGFEESVLVLSMRPRTITRDEKCHH'LVWKGEDLRO	3574
TERMITE	E-----SKPLIQHHVKIAGFKQTVVPMKILRLPLQVTFISDGAKEHQ'LVWKGEDLRO	3633
DAPHNIA	T-----LKVETFRDEIQYLSKQLPVRITVWVAVGAVE'PIVWKGEDLRO	3327
OSTREOCOCCUS	L-----IAPPDASRHTVMGFAPDVLFAKSRPKKILMRGDEKQVLFVWKGEDLRL	3577
STENTOR	D-----QEPKRNSTPSTFDOSILVLSAKKPKRIIGHFSDEKQVLFVWKGEDLRL	3277
KLEBSORMIDIUM	F-----CRPDDGSHVTVGQDITLCSFSLRKPRIKISIDGDEKCKKLVWKGEDLRL	3931
CLUBMOSS	L-----QCPDVSSTHILVGFDETLILSLSKRQPKLITMRSDEKCKKLVWKGEDLRL	3542
MOSS	S-----SIPNLSHVQLLGFDOVLICLKSQRPKLITMRSDEKCKKLVWKGEDLRL	3703
LIVERWORT	F-----REPSDILVHKLLGFDOTLICLSKQRPKLITMRSDEKCKKLVWKGEDLRL	3771
LIGNANO	RDSL'TASLAKPOPELHRIAGFGDTRVWMSLRRPRLITRSDORR'PLVWKGEDLRO	4046
COPEPOD	F-----SRPDTTRHITISSFEPGLNVFSLRKPVKISIDGDEKCKKLVWKGEDLRL	3534
GLOBOSUM	T-----SEPNISQHVLSNFDPNVWMSMRKPKIIMIGDEREY'LVWKGEDLRL	3522
PALUSTRIS	L-----AMPDPOQHVKISFHSFVWMSMRKPKLITIGDDEKHP'LVWKGEDLRL	3589
NEOCALLIMASTIX	K-----YNRPLKHKMISIFNSNIVLNSLRKPKRIEITGDEKQVLFVWKGEDLRL	3696
GLIOMUS	L-----LSIPDPSKHIIKIASFDPKILVLSLRKPKRIITIGDGNHYS'LVWKGEDLRL	3713
LOBOSPOR	L-----TPPNSQQTATVRFDQRVWMSLIRKPKRIKISIDGDEKHLV'LVWKGEDLRL	3685
SYNCEPHALASTRUM	L-----SRPYPEYHARIASFDDRLVWMSLIRKPKRIKISIDGQVLFVWKGEDLRL	3668
FUNCTIVORUM	T-----R1PVPSEHVKITGFDASVILWMSLIRKPKRIKISIDGDEKCKKLVWKGEDLRL	3630
HALBUM	T-----SKPQPEILKISSFDPNLLVWMSLIRKPKRIKISIDGDEKQVLFVWKGEDLRL	3786
DUPURPUREUM	F-----GKQPEYHVTISSFDSNLLVWMSLIRKPKRIKISIDDERD'PLVWKGEDLRL	3795
PVIOACEUM	V-----GKQPPDTHIKISSFDNLLVWMSLIRKPKRIKISIDGDEKQVLFVWKGEDLRL	3787
AMPHIPOD	F-----SKPNVEHHPICISSVDNLLVWMSLIRKPKRIKISIDDEKTY'LVWKGEDLRT	3744
SHRIMP	M-----SKPLPEYHVKISSFDENLLVWMSMRVPMRIIRGDEKCKKLVWKGEDLRT	3715
MUDCRAB	V-----SKPLPEYHVNISFDENWVWMSLRRPRLVIRGDEKDKH'LVWKGEDLRT	3706
TARDIGRADE	R-----ERRRPEYHVKITSGFDQVLLIASIRRPRIIRIGDDEKQVLFVWKGEDLRL	3736
HYDRA	E-----SKPIVEYHVKINGFDERVWMSLIRKPKRIITRDEKQVLFVWKGEDLRO	3607
SALPINGOBECA	T-----EMPIPEHAKITRFDKLLIMASIRRPRLITRSDEREY'LVWKGEDLRT	3830
SPIDER	R-----SKPLPEYHVKIAGFDGKVLVLSLIRKPKRIITRDEKCKKLVWKGEDLRO	3725
LIMULUS	T-----AKPLPEYHVKVSGFDQVRLNLSLRKPKRIITRDEKCKKLVWKGEDLRO	3793
SCORPION	K-----RKPLPEYHVKICNFDQVYVLSLIRKPKRIITRSDQKQ'LVWKGEDLRO	3746
ROTIIFER	N-----EKMPPEYHVKISFDERVWMSLIRKPKRIITRDEKCKKLVWKGEDLRO	3698
CLIONA	K-----SRPLLEYHATITGFDNRVWMSLIRKPKRIITRDEKQVLFVWKGEDLRO	3780
OCTOPOUS	F-----SKPLLEYHVKISSFDQVQVFRSLRKPKRIITRSDNKGKTY'LVWKGEDLRO	3667
CAPITELLA	E-----VCLPEYHAKISSFDSQVTVLRSLRKPKRIITRDEKCKKLVWKGEDLRO	3734
LIMPET	L-----SKPLPEYHVKVAGFDERVWMSLIRKPKRIITRDEKQVLFVWKGEDLRO	3715
SCALLOP	L-----TKPLPEYHVKIAGFDQRVWMSMRKPKRVIRGDEKCKKLVWKGEDLRO	3805
LINGULA	L-----SKMPPEYHVKIAGFDSRVLVLSMRKPKRIITRDMQKH'LVWKGEDLRO	3751
OYSTER	V-----KKMPPEYHVKVAGFQRVWMSLIRKPKRIITRDEREY'LVWKGEDLRO	3753
SNAIL	L-----RKMPPEYHVKVAGFDERVWMSLIRKPKRIITRDEKQVLFVWKGEDLRO	3756
SPONGE	R-----SKPLPEYHAKITRFDKVLVLSLIRKPKRIITRQDTEREY'LVWKGEDLRL	3799
PRIAPULA	R-----SKMPPEYHVKIAGFDERVWMSLIRKPKRIITRDEKCKKLVWKGEDLRO	3783
DANTIO	K-----SKPLPEYHAKITGFDERVWMSLIRKPKRIITRDERO'PLVWKGEDLRO	3754
ESHARK	K-----CKPLPEYHAKITGFDERVWMSLIRKPKRIITRDEKCKKLVWKGEDLRO	3775
BHSHARK	K-----SKMPPEYHAKITGFDERIKVMSLIRKPKRIITRDEKCKKLVWKGEDLRO	3769
XENOPUS	R-----SKMPPEYHVKISGFDERSVMSLIRKPKRIITRDERE'PLVWKGEDLRO	3777
STERLET	K-----CKPLPEYHAKITGFDERIKVMSMRKPKRIITRDERE'PLVWKGEDLRO	3785
GAR	R-----SKPLPEYHAKITGFDERVWMSLIRKPKRIITRDERO'PLVWKGEDLRO	3782
HUMAN	R-----GKPLPEYHVKIAGFDERVWMSLIRKPKRIITRDEREY'LVWKGEDLRO	3760
PLATYPUS	K-----GKPLPEYHAKITGFDERVWMSLIRKPKRIITRDEREY'LVWKGEDLRO	3767
TASDEVIL	R-----GKPLPEYHAKITGFDERVWMSLIRKPKRIITRDEKCKKLVWKGEDLRO	3772
COELACANTH	K-----SKMPPEYHAKITGFDERIKVMSLIRKPKRIITRDEREY'LVWKGEDLRO	3776
CAECILIAN	R-----SKPLPEYHVKISGFDERSVMSLIRKPKRIITRDEKCKKLVWKGEDLRO	3779
CANARY	K-----GKPLPEYHAKISGFDERSVMSLIRKPKRIITRDERE'PLVWKGEDLRO	3768
OSTRICH	K-----GKPLPEYHVKISGFDERIKVMSMRKPKRIITRDERE'PLVWKGEDLRO	3738
GECKO	K-----GKPLPEYHAKITGFDERIKVMSLIRKPKRIITRDERE'PLVWKGEDLRO	3778
TURTLE	K-----SKPLPEYHAKISGFDERIKVMSLIRKPKRIITRDERE'PLVWKGEDLRO	3776
ALLIGATOR	K-----GKPLPEYHAKISGFDERIKVMSLIRKPKRIITRDERE'PLVWKGEDLRO	3735
APLYSIA	L-----DKPLPEYHVKISGFDERVWMSLIRKPKRIITRDERO'PLVWKGEDLRO	3820
TRICHOPLAX	R-----SKPLPEYHVKIASGFERLVLVLSLRKPKRIITRDEKCKKLVWKGEDLRL	3765
SOFTCORAL	Q-----SKPLPEYHVKVAGFGEKVKMSLIRKPKRIITRDEREHT'LVWKGEDLRL	3778
STONYCORAL	K-----TKPLPEYHVKVAGFDEKQVLPVLSIRKPKRIITRDEKCKKLVWKGEDLRL	3804
SEA_ANEMONE	Q-----SKMPPEYHVNIFGFEESVLVLSIRKPKRIITRSDDEREY'LVWKGEDLRL	3752
SEAUCUKE	V-----SKPLPEYHVKIAGFDEQVRLVLSLRKPKRIITRDEKCKKLVWKGEDLRL	3779
LANCELET	K-----VKPLMQYHAKIAGFDQRVWMSLIRKPKRIITRDERO'PLVWKGEDLRO	3835
STARFISH	K-----SKPLPEYHVKIAGFDEQVRLVLSMRKPKRIITRDEREY'LVWKGEDLRL	3825
SEA_URCHIN	S-----KKPLPAYHVKIAGFDETVLILSLIRKPKRIITRDEKQVLFVWKGEDLRL	3806

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TETRAHYMENA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
STYLONCCHIA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
APHANOMYCESa	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
APHANOMYCESa	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
PHYTHIUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
PLASMODIUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
BREMIA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
AEDDES	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
MIDGE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
BOMBUS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
ANT	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
WHIPWORM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TRICHIANELLA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
BEEFLE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
BARNACLE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
THRIP	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
FLA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
WHITEFLY	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TICK	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TERMITE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
DAPHNIA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
OSTREOCOCCLUS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
STENTOR	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
KLEBSORIDIUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
CLUBMOSS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
MOSS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
LIVERWORT	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
LIGNANO	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
COPEPOD	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
GLOBOSUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
PALUSTRIS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
NEOCALLIMASTIX	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
GLOMUS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
LOBOSPOR	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SYNCEPHALASTRUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
FUNCTIVORUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
HALBUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
DUPURPUREUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
PVIOLACEUM	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
AMPHIPOD	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SHRIMP	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
MUDCRAB	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TARDIGRADE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
HYDRA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SALPINGOCEA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SPIDER	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
LIMULUS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SCORPION	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
ROTIFFER	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
CIONA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
OCTOPOUS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
CAPITELLA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
LIMPET	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SCALLOP	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
LINGULA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
OYSTER	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SNAIL	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SPONGE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
PRIAPULA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
DANTIO	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
ESHARK	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
BHARK	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
XENOPUS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
STERLET	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
GAR	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
HUMAN	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
PLATYPUS	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TASDEVIL	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
COELACANTH	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
CAECILIAN	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
CANARY	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
OSTRICH	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
GECKO	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TURTLE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
ALLIGATOR	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
APLYSIA	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
TRICHOPLAX	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SOFTCORAL	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
STONYCORAL	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SEA ANEMONE	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SEACUCU	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
LANCELET	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
STARFISH	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046
SEA_URCHIN	DRIEELLQVMMNIFKADPP	OSKE	LNLSRNIIPMNIKLLEAVDK	SVLKEILNK	4046

* : * :

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	EHQEEEGLE-----LFXNKALSKRDEYAAKAAK---RQCQYNE-----	3681
TETRAHYMENA	EFQEKMGSKED-----IAQDNEGLRMRREWLKQL---DRKGGLA-----	4082
STYLONCHEIA	EHRNEAGKD-----LNQSRALNERRKWLKSSVPGNAKKEGKIT-----	3954
APHANOMYCESa	EWDDG-----T---SSKKTNLLQRPQVQYEFWAK-----QR-----	3500
APHANOMYCESa	EM-----STTKSNLLQSPPGQLYENFWSK-----QR-----	3423
PYTHIUM	QLQVDLRCETELLS---NKRAKQLFNTPAKNYETYLK-----QR-----	3732
PLASMOPIARA	QLQIDERCVLKLS---NNSQKLDLNFNTAAKAYESFLLLE-----QR-----	3696
BREIMIA	QMVDERCIDLKS---DKSKKLDLNFNTAAKAYESFHRK-----QQ-----	3679
AEDES	SMVRFNTD---GD-----VTGAINAETIQLFHE-----ASGMT---RSPS	3727
MIDGE	TTSNFIQKSLYD-----FIPEIRNEYKNFLIG-----NENFT---T---	3748
BOMBUS	TLSKQETIE-----RHNSISKLYQEWIQN-----VAPSK-----	3575
ANT	TLNRKEKE-----CKMIRDEYAGWLN-----APMK-----	3652
WHIPWORM	---PADRRN-----YQAMALKALSEGPIA-----ILLTWPWGGL-----	3697
TRICHINELLA	---ESLRKQ-----YQTIAMEMTEGPEK-----ILLKAAGESS-----	3701
BEEBLE	-----EN-----F-DKVVVETFTKWIYT-----SANQS-----P	3543
BARNACLE	ACP---DLEQ-----QCAEARELFRKQMR-----HATQS-----G	3587
THRIP	SRQLSDQDR-----VSIRTKHESWLK-----YVKVK-----D	3636
FLEA	--KEPGKLN-----RVEEVRSYKNIWIRQ-----ASKTD-----P	3626
WHITEFLY	FFLESDETEK-----YKQVAEHYSTWLSK-----CCRTN-----P	3716
TICK	GLDESSQGN-----LARC-SRSPGLWSTE-----D-----	3656
TERMITE	VLDKNEKES-----YKKS-CEEHCKWISK-----PCNPQ-----C	3720
DAPHNIA	DINFRSSLKSLK-----P-----DLERK-----LSAN-----	3407
OSTREOCOCCUS	PVTGMDID-----PFKEHQRWIREHARGIGKRRKIDAGG-----EM	3671
STENTOR	ELSKYISL-----TBANKRQVWLS-----LPAI-----T	3364
KLEBSORMIDIUM	GLAASNLQTPDGA-----KTLSDVQGWQWLT-----HGA-----V	4025
CLUBMOSS	GVAQQLAAAKRKEK-----AGDLLVELRNQYHOFVKE-----KGG-----	3636
MOSS	GLSKLASRTHGYKPLQATSETLLKEIQHEYIEWVRK-----KGG-----	3803
LIVERWORT	GLLCKMNLNRREGKDA---PLAFLHKLRAQYHEWIMK-----RGGP-----S	3868
LIGNANO	QMSAAEQRSK-----OSLDYCKFVSN-----	4127
COPEPOD	DRKAETEILEA-----RN-----	3605
GLOBOSUM	SPQFDKMAE-----SQAEYSAPVVK-----FGKS-----G	3606
PALUSTRIS	IPGFKGEYSK-----ADQKHAAPVNS-----YKGH-----A	3673
NEOCALLIMASTIX	MLDDKNLITN-----SRNIYCDWVNS-----FYKR-----G	3780
GLOMUS	EPRTSKVFD-----AQSMHSRW-----V-----Q	3791
LOBOSPOR	EIPHKETWRK-----AQDYNNKFVAS-----FK-----G	3767
SYNCEPHALASTRUM	EVPSALI-A-----ARKAYLAFVVK-----HG-----Q	3749
FUNCTIVORUM	QLAKPTKPKADT-----SLLKTSAAQQDAMVKS-----FGSKVY-GKRR	3728
HALBUM	QMAVHQNVERSNV-----SLSRMEAYITHNEWINS-----FGKYLK-MAN-	3883
DPURPUREUM	QIAIQTTPRSNV-----SISKLEANTHINHWIQS-----FAKYSK-I-N-	3891
PVIOLACEUM	QLAIQTMPRSQV-----SISRLESTKIHNDWIQE-----FSKYLK-GGA-	3884
AMPHIPOD	ALTDTEKRPYS-----KNLVK-----YGDG-----	3824
SHRIMP	SYRENETKCYG-----EARAL-----YKGN-----	3795
MUDCRAB	SFKEGEAKCLD-----EAETF-----YRTE-----	3786
TARDIGRADE	AQSPQDKVSLT-----ASFARYDLIRKQLKISDKKAIPTYAGGK-E-RL	3838
HYDRA	DD---EKKVL-----H-GPSGPKIKYQPYGK-----FEN-----	3691
SALPINGOBECA	GMTDAEREDAKKR-----K-ATQLPQNHFSQFANR-----FSKD-----	3921
SPIDER	GMSETEKKQFY-----KRDGNLAQSEILQWD-----R-----KA	3812
LIMULUS	MFTKQDQERIN-----QAEKKFHSYMKLSL-----SP-----QE	3881
SCORPION	AMTDKESFR-----ESDPKMTYFKLLSK-----TW-----SR	3834
ROTIFFER	DLVNEAQNYA-----EFTYG-----INKD-----G-SK	3779
CIONA	QAKRNNCNSCI-----TEPARTWIPK-----NMVOK-----	3864
OCTOPUS	VLEEKENYIME-----TIERHREFKPK-----YVA-----	3750
CAPITELLA	GCSDVSWEQIQNK-----N-LPNNPANLLCQWI-----GDS---S-NT	3825
LIMPET	ALTEQERKYL-----GDQPGKQKHENWYK-----YFDA---K-K-	3805
SCALLOP	SLTDQERNFVH-----H-KTNGPNGQHTAWLQK-----LGKD-----	3894
LINGULA	TMTEQEAQK-----AA---ILQRNPLSR-----YGNP---S-D-	3837
OYSTER	NLTEQEAQVVS-----GNLHNSWIMK-----L-S---K-DP	3837
SNAIL	AMTEKERTAYF-----GENGSQLHYKWLK-----L-P---K-K-	3844
SPONGE	SDPEKK---SL-----PAASKMNQKWLQ-----KFGGS-----	3883
PRIAPULA	AMTQQQYDAYY-----S-YSMNPVEHFNKWAAAT-----ALTASES-K-RA	3878
DANTIO	RRTTEQKQT-----ITRPNEFYDEWISK-----VAG---K---	3839
ESHARK	NITETQSRR-----QQEVLPKYREWLK-----MGR---K---	3862
BHARK	NMTEDEHKRP-----SP---KELFSEWLQ-----ISGS---K---	3854
XENOPUS	TMTEDEAKIYNS-----K-TTNGPLYHYNAWLDK-----KEK---K---	3866
STERLET	RMTTEERKH-----CKRPAESYMEWLSK-----VAG---K---	3870
GAR	RRTTEPEKS-----SPSPQDMYSAWLEK-----ISR---R---	3867
HUMAN	TMSQEEKAAYL-----S-DPRAPPCEYKDWLTK-----MSG-----	3848
PLATYPUS	SMSEGEKAAE-----S-NPKGPVHEYSWLYK-----MSK-----	3855
TASDEVIL	NMSEEEKAAE-----S-GPKAPQLEYSWTLTK-----ITG-----	3860
COELACANTH	AMTEEERTNYETL-----S-PKKGPKAQYNEWLT-----MAGG-----	3867
CAECILIAN	SMSEAEQENCS-----ST---TKHYKDWIQR-----MGR-----	3863
CANARY	SMSEEDINYY-----SPRGPATYSEWLSR-----MGG---K---	3856
OSTRICH	SMSEEDFNYS-----SKKGPATYNEWLSK-----MGG---K---	3826
GECKO	NMSEKQNDIN-----SKKGPADYNEWLSK-----MGD---R---	3866
TURTLE	SMSEKQDYH-----SKKGPRIYSDWLSK-----MAGK-----	3864
ALLIGATOR	NMSEEEKADYC-----SEKGPLFAYNEWLSK-----MAGG---K---	3824
APLYSIA	AYTEERKPLE-----G-N-QSPVIQHNQWMAK-----LVDK---K-DS	3911
TRICHOPLAX	AMEDHEKQHYL-----S-SQNSPHOLYSKWLK-----FGSA---G---	3855
SOFTCORAL	GLSETENETFD-----T-I---GYKHKNWIVE-----KFPVN---GN	3866
STONYCORAL	AMTKAENDHYI-----G-P-NAGACYRNWIDK-----FKGD-----P	3893
SEA ANEMONE	AATESEKQAMV-----V-RRKTKNML-----D-----	3831
SEACUCU	KSLD-----KSKLEAYGNWVQK-----FRTK---KD	3860
LANCELET	AMTTREQEAFL-----H-Q-RLPLDFDAYVHR-----LGGT---V-KN	3926
STARFISH	AMTEQEGNAYN-----S-R-HGPRYQHSWVQK-----YAKG---NQ	3915
SEA URCHIN	SMTEAEHKVYT-----S-RTTGPVALFPTWLQK-----FCQT---DG	3897

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	KNKNFEVI-GVLQENATDVVSN-----NEQ-KKYVKD LL RNGLSK SA LEAVF	3732
TETRAHYMENA	----EQH-IKQLQEPDSKIQEA-----NEQ-ADLIPR VFR NALER ASTC EAVLY	4128
STYLONCHIA	----DQH-ICLLGCDEKIVIEG-----NKH-KEALP WYLL RNGLN ENCL TSSAFLA	4000
APHANOMYCESA	---GKTYG-QKVATSATSAVVSS-----VQA-EAAV PCD LLRRRLV HMA TSDTFQ	3548
APHANOMYCESE	---GKTYG-QKIATASSAVTLV-----SQA-QEMV MDL LRRLV NMA CTBAFFQ	3471
PYTHIUM	---GGSPA-AKVIAPSHKDVVAN-----EGA-QALIP ADL LRLLQL GT GSDFEVS	3780
PLASMODIUM	---GATYS-AKVVASRSEDVDFH-----AKV-HAMIP DLR LRRLQL GT GSDFEVS	3744
BREMIA	---GASFS-AKIVAPRSKDVVDF-----HRV-QAMIP ADL LRRLQL GT FEARLL	3727
AEDDES	TPLSKLYG-KVAACCTPERITLK-----NEL-RYKIK ED FRKAL FEMAV QSSYS	3778
MIDGE	--FSNAYT-NALLRRGGGAMAEF-----ASF-EALLP ODL LRRLS ME SSMVEFYH	3797
BOMBUS	Q-LHEKYK-EAIVKMASSEVTMK-----NEF-IGKTE WEL KRKTL TVL CGSLISHT	3625
ANT	QRITDRYK-EAVSRYSQVMWEMN-----KKL-ISKTR Q ALRDA ETI SSSPACVVT	3703
WHIPWORM	--TPSVYV-KSYATATPTAVVRC-----RHL-LDQIP RHL LRHLK LNC CASPDVQC	3746
TRICHINELLA	PLNHLTYY-RSQNITPTPTAARC-----NEV-LKKIP DHL LRDLQ LNC CVSPDVCF	3752
BEEBLE	---FDAYG-RAAMKYSRDKTVK-----KTL-VSKIS WDV FRST LK SSVTEGFA	3591
BARNACLE	ANDVQLQS-EYARRAPRDVVADLAAREALMRDE-RGRACS LL QAVFR SS SGPEALLR	3645
THRIP	Q-NINIYQ-IAHQDISREASVTF-----NKL-VSMTK PDL LRKGL QL SSSAEGEYV	3686
FLEA	TSPVALYG-NAVVHYHRDAVISK-----QEL-VNRIP EDL LRKDS F KEMSA VE SPT	3677
WHITEFLY	T-AGRIYQ-SAAQTYSRQVVINTY-----NEH-VSKLE KI LRKRS MS SLDLEARTS	3766
TICK	-----YAKYKEPSQAVSRP-----GRC-VRQVS RE SLK AL LGT SS CPARFA	3699
TERMITE	S-FYEKYG-EAHMKYSPEETSAP-----RKK-VNMI PDL LRRAL QR SVSPESHFI	3770
DAPHNIA	-----NP-LHFMTATQLQLND-----SNF-ADRVP YL LRGAL KK SSSPESHFY	3452
OSTREOCOCCLUS	TTTHEDYL-AAIKKASRKESTLL-----SRLR SS SSS SR LRLL EL QMGVAFM	3723
STENTOR	TNMLPALH-LEALKDSSTISN-----REH-ESL W DLR Q GLSL ST PSMH	3415
KLBSORIMIDIUM	SSLQEAQY-KSYTSLRSQFQAQ-----GVA-GGKLP S DALRAG IAQ APGQSELA	4076
CLUMBOSS	KSVHDCYK-NLYTKVKAGEMEARM-----NAL-VAQV P DAL T GLYK R SSASELA	3687
MOSS	KSQTECYC-NLYRKVGFEEVSLK-----SAL-QGOL P DL R MG S SRV TS ASVLA	3854
LIVERWORT	QAPPECYR-NMYQKATSDEVTKM-----SSI-EAQMP WD FRAG R SVR ATS ASVLA	3919
LIGNANO	-DHC-----KLYTSLDQVVQRN-----QPL-LDCVP DL LRGLR Q SSSWAYYA	4173
COPEPOD	----AY--KVGKENTSDDIRK-----EKA-VELVE KY LRKNS LK SSSMGEY	3650
GLOBOSUM	SGPGGAYE-PPMNNATPRHVIENM-----QSI-WNKNS RYL RFF LK TISA AF FFQ	3657
PALUSTRIS	RNLGDMYG-NMFRKANRRTMDHM-----SSL-T--SFE P YL R TMH K AS P AF L S	3722
NEOCALLIMASTIX	S--ENVFH-TMFKKASREDTINNL-----IKV-ENQIP K LR K LY L IR PD ILIK	3829
GLOMUS	Q--YKSYH-NMFMEVNRDAVQHP-----KDL-QREIS ND MLK AL YK ST SPSHIS	3840
LOBOSPOR	D--MMGYH-NLFINGTREKVVKHM-----ESL-YNQF RED YL Q SR AS AS AF AM	3816
SYNCEPHALASTRUM	N--VTSYV-TTYKESRDSVRA-----EQS-VSHLE P DL R HL LK SS AF FF	3798
FUNGIVORUM	LNPCDYYY-AMFQHANRAETDKQ-----TKH-AEGL P DL L RK GL F AS AS AF FF	3779
HALBUM	PPAGPLYQ-QMPHSDRADAIKK-----EKQ-HDKVP AL LR NG IWA SS PSHLF	3934
DPURPUREUM	-SPGPLYQ-QMFIHANRDNAVKK-----EKQ-IAKVP EL LR NG IWA SS PSHLF	3941
PVIOLACEUM	-AAGPLYQ-QMFIHANRDNAVKK-----DRQ-HARIP ADL LR NG IWA SS PSHLF	3934
AMPHIPOD	----LST-QDLLKQSKVDCVKA-----SEV-VNSLP WD LRRLS ND ASSY SE FFV	3870
SHRIMP	----ENY-TVAKKAKKRDVKA-----EEV-VNKIP WD LRRLV RS SSST GE FFS	3841
MUDCRAB	----EPW-NFRKKTDKRRVKK-----EDA-VNRIP WD LRRLV RS SSST GE FFS	3832
TARIGRADE	ISEKDLNN-RAFLEVKPADMRKI-----QQV-TRLP DL LR RQ LR Q TV SP PA LI I	3889
HYDRA	----VNS-NVYKSANRSETVKVP-----EDC-VSTVP DL LRRA EK TAL SS PA FT V	3736
SALPINGOECA	PSPLKMYH-SVMTKAKRSDISRS-----LER-QALVP DL LR DAL LH ST TP PA MT	3972
SPIDER	ENLASHMH-SFYMKKTRECEIQK-----EKI-VNFVP DL LR KK S LK SSSP PA MT	3863
LIMULUS	----VSR-NAYRKLGRKETLKA-----QEV-VDLVP SD LR R AG VK SS PA MT	3927
SCORPION	DKSTPLLY-ENIKYIAOTEVAKK-----TEC-DMIP WD LRRA LK SS PA MT	3885
ROTIFFER	KTQSEVYG-MYAKYSRELICRE-----DKI-QNSIP WD LR Q FP RT SS PA MT	3830
CIONA	-PPCETYG-VLMQRGSYAQVVEK-----KRA-ENMLP WD LR Q AV IR LA Q PS VA	3914
OCTOPUS	----SGIM-NIFKCKKTDDELG-----QSI-CARIP ODL LR RS KK MS TS PA MT	3797
CAPITELLA	RQMIENYR-KCYQKYSRNETLNA-----KKR-EAMVP WD LR R KS Q K AS SS PA MT	3876
LIMPET	RCIKSMYQ-KVYQYNSRAETIKD-----RMK-ENKVP WD LR RRA HQ MS TS PA MT	3856
SCALLOP	LPLAKMYG-LMYQYKNTAEAREL-----RLK-ENKIP WD LR RRA HD IS TS PA MT	3945
LINGULA	PNICKKYW-GMYERCSRTEAVKSC-----QDK-ENSLP WD LR RRA LQ MS TS PA MT	3888
OYSTER	RDVQQGYM-QMYLYNMTETRREL-----QKK-ENIP WD LR RRA HK MS TS PA MT	3888
SNAIL	TDWGLIYG-QVYQYNSKTEMKEP-----RIK-ESKVP WD LR RRA QH MS TS PA MT	3895
SPONGE	-NYVNWYY-EMYKLLKADEVKKE-----RRI-VSAPV WD LR RS L TS D AS TS PA MT	3933
PRILAPULA	ASHVKLYA-RTFVQCSKSDTVRS-----RER-ESMVP DL LR Q AL R SS PA MT	3929
DANIO	VEGIRRYA-ELYKAKRDTVMN-----RRI-EQV PD DL RRA V MS TS PA MT	3890
ESHARK	--DMFLRYP-TMYLKASRTETVTA-----RTH-EQAIP CDL LRRA LK SS PA MT	3912
BSHARK	SDVTLYG-QMYMKASRTETVKA-----RQC-ERAVP DL LRRA TK MS TS PA MT	3905
XENOPUS	VGDARQHV-TSYTRCDRTNTVAS-----RER-EALVP DL LRRA VK MS TS PA MT	3917
STERLET	EKGIAQYI-TMYKTAKRTETVRA-----RNV-EHV PE DL LRRA MK MS TS PA MT	3921
GAR	SKGQEYH-EVYKASRTEVTAN-----QSI-EKLPV ODL LRRA IQ SS PA MT	3918
HUMAN	KHDVGAYM-LMYKGANRTEVTSP-----RKR-ESKVP ADL LRRA VK MS TS PA MT	3899
PLATYPUS	KQDFGAYM-LMYKHASRTEAVTAP-----RNR-ENRVP CDL LRRA VK MS TS PA MT	3906
TASDEVIL	KQDISAYM-LMYRRANRTEVITS-----RNR-ESKVP ADL LRRA VK MS TS PA MT	3911
COELACANTH	SVGPQRYG-SMYKASRTEVTMA-----RSV-ESLVS RD LRRA TK MS TS PA MT	3918
CAECILIAN	CDNISRYE-YMYRRASYTETVVA-----KAR-ENLVP GD LRRA TK MS TS PA MT	3914
CANARY	AQGISRYH-AMYRASRTEAVTSP-----KSR-ESSVP ED LRRA VK MS TS PA MT	3907
OSTRICH	AGGVPRH-VMYRRANRTEVTMS-----KSR-ESSVP ED LRRA VK MS TS PA MT	3877
GECKO	NAGLVNYY-SMYKASRTEVTSP-----QQR-ENLVP ED LRRA VK MS TS PA MT	3917
TURTLE	ENGIARXK-TMYSRANRTEVTLS-----RNR-ETSVP CDL LRRA VK MS TS PA MT	3915
ALLIGATOR	IEDFARYM-PMYKASRTEVTMS-----RNR-ENRVP ED LRRA VK MS TS PA MT	3875
APLYSIA	GNWQMMYD-RVMYKYSHTETVKE-----RLK-QGKIP W LR RRA Q Q SS PA MT	3962
TRICHOPLAX	-GPVYMYQ-SMYRKAARSEVENH-----KFR-ENSVP WD LR RG V AS SS PA MT	3905
SOFTCORAL	KHIINNYI-PMFKKASREVIERK-----REL-QNLMP H DAL RRS MR AS SS PA MT	3917
STONYCORAL	RNPSRFYG-EMFKKANRTETERS-----TQK-QALVP WD LRRA LQ AV SP PA MT	3944
SEA ANEMONE	LTLRILFDIIISREANRDTSESE-----KKK-QAQVP WD LRRA Q AV SP PA MT	3883
SEACUKE	EKIHLTFA-TMYKQAGLQETHN-----RQC-EBEIP WD LR RKA L ES SS PA MT	3911
LANCELET	DPWGVYQ-SLYQKASRTDVTLA-----RQV-OSKV TD LR RG LQ MS SS PA MT	3977
STARFISH	SNHGVRYG-AVYRHANYDVTVKC-----RSW-EALVP WD LR RRA I Q SS PA MT	3966
SEA URCHIN	-NITKLP-EAYKKANETETIKA-----RER-EAKLP WD LR RG MO SS PA MT	3947

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	I RDK F L I V G I L A G V I L I G D R H L E F I L L N Y S N R L L I D F P S F S Q L L --- A L P I P E	3789
TETRAHYMENA	L K E R I R V V V V V G V I L I G D R H L E F L A N Y S N G D I V S I D F G V S F G A L --- G L A V P E	4185
STYLOCNCHIA	L K N Q F T K L A F P F I S V L I G I G D R H L E F L I D T S D G E I L I D F G I A F G S I I --- Q L I P E	4057
APHANOMYCEsa	L R E S A T L A F A F N G S V L I G I G D R H L D N F L D E R T A V V G I D F G I S F G A A --- S L L P V P E	3606
APHANOMYCEse	L R E T S T S L A F A F N G S V L I G I G D R H L D N F L D Y I T Q T V V G I D F G I S F G S A --- S M L P V P E	3529
PYTHIUM	I R D Q F A S L I G V F S A S V I L I G D R H L D N F L D H Q T G R V I G I D F G V S F G A A --- S V L P V P E	3838
PLASMOPARA	V R D N L K S L A V F S A S V I L I G D R H L D N F L D L G S G R V I G I D F G V S F G A A --- S V L P V P E	3802
BREMIA	V R D H L K S L A V F S A S V I L I G D R H L D N F L D L S S G R V I G I D F G V S F G A A --- S V L P I P E	3785
AEDDES	L R G N F A K S L A M A V V C W I L I G D R H T S N V L D R S N G L A G V D F G I A F G A T --- R D I P I P E	3836
MIDGE	L R Q N F I T S V M A M V H H I L I G D R H M N I L D M K T G R L I D F G V A F G A T --- T L I P E	3854
BOMBUS	M R R N I T S V M T M I H I L I G D R H L E M F L V D S G R C L I D F G L A D A V --- D R I P E	3682
ANT	L R R N V T T M T I H I L I G D R H L Q M F L V O A T G R I G I D F S A F G S I --- R A P I P E	3760
WHIPWORM	L R E R V A L L A L V V T V L I G D R H L D N I L D T S M E L L I D F G Y A F G S L --- Q L L P I P E	3804
TRICHIANELLA	L R Q K T V L L S M L I N L L I G D R H L G I V L D P K T E V I D F G Y A F G A L --- Q Y L P I P E	3810
BEE TLE	L R N N I K Y N I M C A S H I V V G D R H L S S L V C L N S G K V L I D F G H A F G T D --- Q I L P V P E	3649
BARNACLE	L R T R M A E S H L L A G L L V G D R H L G F L V S L E D G A M I G I D F G H V F G S N T --- S L L P V P E	3703
THRIP	L R H S I T S V T L I H I L I G V D R H L Q C L V S Q T N Q C I G I D F G H V F G S N T --- L N L P V P E	3744
FLEA	L R H N P A T S Y G I M I H I L I G I G D R H L S N C L I N I N S G F A V G I D F N C A F G S V --- M T L P I P E	3735
WHITEFLY	M R N E L C S Y V M I G H I L I G I G D R H L S M L V N L F T G K C L I D F G H A F G S N T --- Q I L P V P E	3824
TICK	L R S R F V L S H T L V H V L V G D R H L G F L V S T N T G L E I G I D F G Y A F G L A --- Q F L P I P E	3757
TERMITE	L R Q S F A C S V V L I H I L I G I G D R H L S N I L V S V K D G R C V I D F G S A F G T T --- Q F L P V P E	3828
DAPHNIA	L R N R L A T S H Q T Q L L A I L I G V D R H L S F L V S T K N G I D I G I G M A F G M T --- S Q L P V P E	3510
OSTREOCOCCUS	M R Q A A A S S S I G V A V G D R H L D M I L D L S T Q L V H I D F G Y A F G T T --- S A L P I P E	3781
STENTOR	L R Q I T E R P A L I G I I L I G I G D R H L E M F L S D S G L I G I D F G V S F G S V --- G H L P E	3472
KLEBSORIDIUM	L R Q C A R L A L A T I G V A V G D R H L Q F L D V A D F T L I G I D F S Y S F G T T --- Q M L P V P E	4134
CLUBMOSS	M R S Q A R L S V M L G C I A V G D R H L A T L I D M Q T S I A N I D F G Y S F G T V --- I L L P V P E	3745
MOSS	L R S Q A R L S V T R L G C V A V G D R H L G T L V D M R T G A L V E I D F G Y S F G T V --- L L L P V P E	3912
LIVERWORT	L R S Q A K L S V I S I G V A V G D R H L A T L V D M R T G A L V E I D F G Y S F G T V --- I L L P V P E	3977
LIGNANO	M R D T L V R S H A M G H W L L S V G D R H M S N Y M L C L D S G K M I G I D F G Y A F G T I --- T F L P T P E	4231
COPEPOD	I R K N I T S V M L V M Q I L I G I G D R H L S N Y L V C Q K T G R V V I D F G Y A F G I S T --- S F L P I P E	3708
GLOBOSUM	I R G E P A N S P A L I G S V L I G I G D R H L D N F L V N L K N G K I V G I D F G H A F G S N T --- E V L P I P E	3715
PALUSTRIS	I R A Q F A K S L A T L A I G S V L I G I G D R H A E N F L D M T T G Q I V G I D F G H A F G S N T --- E V L P I P E	3780
NEOCALLIMASTIX	I R N E V A N S L A I I G S V I L I G I G D R H L E F L V N K N S Q L I G I D F G H A F G T T --- E V L A I P E	3887
GLOMUS	I R S E I K H W I L I G I L I G I G D R H L E F L V D T T K G S L I G I D F G H A F G S N T --- E T L P I P E	3898
LOBOSPOR	L R S E P T R S L A I H V G S V I L I G D R H L E F L D M S S G C L I P I D F G H A F G S N T --- E V L P V P E	3874
SYNCEPHALASTRUM	I R N G A N S L A V T I S G V L I G D R H L E M F L D L S K S R L V H I D F G H A F G S N T --- E Q L P V P E	3856
FUNCTIVORUM	L R S Q A K L S V F S I G I L I G I G D R H L E M F L S T G S L I G I D F G H A F G T T --- Q F L P I P E	3837
HALBUM	L R N S A R L D F P F I S V I L I G D R H L E F L I S Q D R I L I G I D F G H A F G T T --- Q F L P I P E	3992
DUPURPUREUM	L R N S A R L D F P F V S V I L I G D R H L E F L I S Q D R T L I G I D F G H A F G T T --- Q F L P I P E	3999
PVIOLACEUM	L R N S A R L A F A F I S S V I L I G I G D R H L E F L I S Q D G R L I G I D F G H A F G T D --- Q F L P I P E	3992
AMPHIPOD	I R T K C S H V L I S I Q L L I G I G D R H L C N F L V D Y K T T M V G I D F G H H F G T T --- Q F L P L P E	3928
SHRIMP	L R S A A V S Y A L I S Q L L I G I G D R H C S N S L V S L K T G R V I G I D F G H H F G S A V --- Q F L P V P E	3899
MUDCRAB	L R S L P A N S Y M V M V H I L I G I G D R H C G M T V S L K T G R V V G I D F G H H F G T V --- Q V L P P P E	3890
TARDIGRADE	V R N L P A Q F G V M I G I Q V L I G I G D R H L S N C M V S T E T G L F I D F G H A F G S V --- Q S L P I A E	3947
HYDRA	L R K N I Q S H S C L I H I L I G I G D R H L N M L D N K T G V V G I D F G Y A F G I T --- Q L L K Y P E	3794
SALPINGOBECA	I R Q L G R L A T M M I G I Q I L I G I G D R H L S N S M I D L R T G V V G I D F G H N F G S N T --- Q E L P I P E	4030
SPIDER	L R T K A K S H V I L I G I Q I L I G I G D R H L G F L I D K T S G C E T I D F G H A F G S N T --- Q F L P V P E	3921
LIMULUS	L R S Q V I S H V L I S I Q L L I G I G D R H L G F L I K T D T G K E L I D F G H A F G S N T --- Q F L P V P E	3985
SCORPION	L R N I T E R V L I G I Q L L I G I G D R H G F L S T T T G I E I D F G H A F G T T --- Q F L P I P E	3943
ROTIIFER	L R N E I K L V A V L G I L I G I G D R H L S N W M L K T R A L I D F L A F G T T --- M H I P V P E	3888
CIONA	L R K R T S Y V M V V H H I L I G D R H L S N M L S L T T E V V G I D F G H A F G S N T --- E V L P V P E	3972
OCTOPOUS	L R T G T I I H V L L I G H I L I G V D R H L S L M I H Q G T Q M I D F G H A F G S N T --- Q Y L L I P E	3855
CAPITTELLA	L R G N C A T S H L N I S A Y I M G I G D R H L S N H M V D L I N G K M I D I D F G H A F G S N T --- Q F L P I P E	3934
LIMPET	L R C E L V V H T I S I Q Y F L I G I G D R H L S N F M I N L K T G M V G I D F G H N F G S N T --- Q F L P V P E	3914
SCALLOP	L R C T L A V S H M L V S I Q Y I L I G I G D R H L S N F M I N L K T G M I G I D F G H A F G S N T --- Q F L L I P E	4003
LINGULA	L R R F A I S H L L I G H I L I G I G D R H L S N F M V D L E T G M I G I D F G H A F G S N T --- Q F L P V P E	3946
OYSTER	L R C K C A S H L L I G I Q V L I G I G D R H L S N F M I N L K N G E M V G I D F G H A F G S N T --- Q F L P I P E	3946
SNAIL	L R C E M L T S H V L I G H I L I G I G D R H L S N F M V N G R T G H M V G I D F G H A F G S N T --- Q F I P V P E	3953
SPONGE	L R C T I Q S L S V I L I G I Q I L I G I G D R H L S N F M V M E T G Q L V G I D F G H A F H S N T --- Q F L P L P E	3991
PRIAPULA	L R T H I R S H M L V H I V V V G D R H L S N F M V S Q E D G M V G I D F G H A F G S H P R C C L P I P E	3989
DANTO	L R S H S S H V L I S I Q L L I G I G D R H L S N F M I N T E T G M I G I D F G H A F G S N T --- Q F L P V P E	3948
ESHARK	L R S H A S H M L I S H I L I G I G D R H L S N F M W L E T G M I G I D F G H A F G T T --- Q F L P V P E	3970
BSHARK	L R S H A S H M L V S H I L I G I G D R H L S N F M I N L E T G M V G I D F G H A F G S N T --- Q F L P V P E	3963
XENOPUS	L R S H A R S H L L V S H I N G I G D R H L S N F M I N M E T G M I G I D F G H A F G T T --- Q F L P V P E	3975
STERLET	L R S H T C S H M L V S H I L I G I G D R H L S N F M I N M E T G M V G I D F G H A F G S N T --- Q F L P V P E	3979
GAR	L R S H A S H L I S V S H I L I G I G D R H L S N F M V N M E T G M V G I D F G H A F G S N T --- Q F L T V P E	3976
HUMAN	L R S H A S H L I S I H I L I G I G D R H L N F M V A M E T G V I G I D F G H A F G S N T --- Q F L P V P E	3957
PLATYPUS	L R S H A R S H L L V S H I L I G I G D R H L S N F M I N L E T G M V G I D F G H A F G S N T --- Q F L P V P E	3964
TASDEVIL	L R S H A S H M L M I S H I L I G I G D R H L S N F M I N M E T G M I G I D F G H A F G S N T --- Q F L P V P E	3969
COELACANTH	L R S H A S H M L I S H I L I G I G D R H L S N F M I N M E T G M V G I D F G H A F G S N T --- Q F L P V P E	3976
CAECILIAN	L R S H A S H M L I S H I L I G I G D R H L S N F M I N M E T G M V G I D F G H A F G S N T --- Q F L P V P E	3972
CANARY	L R S H A S H M L I S H I L I G I G D R H L S N F M I N K E T G M V G I D F G Y A F G A T --- Q F L P V P E	3965
OSTRICH	L R S H A S H M L I S H I L I G I G D R H L S N F M I N K E T G M V G I D F G H A F G S N T --- Q F L P V P E	3935
GECKO	L R S H A S H M L I S H I L I G I G D R H L S N F M I N M E T G M V G I D F G H A F G S N T --- Q F L P V P E	3975
TURTLE	L R S H A S H M L M I S H I L I G I G D R H L S N F M I N M E T G M V G I D F G H A F G S N T --- Q F L P V P E	3973
ALLIGATOR	L R S H T S H L L I S H I L I G I G D R H L S N F M I N T E T G I L I D F G Y A F G S N T --- Q M L P V P E	3933
APLYSIA	L R T S L V T H T L L Q V L L I G I G D R H L S N F M V S L K T G H M I D F G H A F G T T --- Q F L P V P E	4020
TRICHOPLAX	L R S H A R H I V V I S I H I L I G I G D R H L S N F M I D R L T G M I G I D F G H A F G S N T --- Q F L P L P E	3963
SOFTCORAL	L R A Y A R Y C M I G H I L I G I G D R H L S N S M V D L Q G R V I G I D F G H A F G S N T --- Q F L P L P E	3975
STONYCORAL	L R S H A S H M C L I Q Y I L I G I G D R H L S N F L V D M E T G M I G I D F G H A F G S N T --- Q F P L P E	4002
SEA ANEMONE	L R T H A R S H C I C I Q V L I G I G D R H L S N F L V D M R T G L I G I D F G H S F G S N T --- Q F L P V P E	3941
SEA CUCUR	L R T H A K S F N L I Q Y I L I G I G D R H L S N F L S L N S G R M I G I D F G H A F G S N T --- L I L P I P E	3969
LANCELET	L R S H T T H L L I Q V L I G I G D R H L G F M I D L S G M V G I D F G H A F G S N T --- Q H L P V P E	4035
STARFISH	L R S H A R S H V I L I Q Y I L I G I G D R H L S N F L I S L K T G M I G I D F G H A F G S N T --- Q F L P V P E	4024
SEA_URCHIN	L R A H E A R S H V L I Q Y I L I G I G D R H L S N F L S L E T G M V G I D F G H S F G S N T --- Q F L P I P E	4005

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Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	LMPRLRQVPEGLAKPIG--LGGLVKSQFVKIMSALRKKRHHLLDFCVFIIQPLIEGIIK	3847
TETRAHYMENA	LMPRLRQVPEGLAKPIG--INGIQRQSMISSMMALKKKRHHLLDFCVFIIQPLIEGIIK	4243
STYLYONCHIA	LMPRLRQVPEGLAKPIG--LEGVYKOTMVHAINALKRRKSLMDTCLIFVKEPLLDVVK	4115
APHANOMYCEsa	LVPFRYKQIRGVLPQHD--ASLLQDQAAVLDALRQQQQRDSVVRVFLNEPLLEQV	3664
APHANOMYCEsa	LVPFRYKQIRGVLPQHD--AKLLFQDAAVLEALRQQHQRQESVSVFLNEPLLEQV	3587
PYTHIUM	LIPFRYRQMEAVLPQYD--GNSLLIQDQAVFEALREKKQVIESVMNVFLHDPILLDQO	3896
PLASMOPARA	LIPFRYRQMEAVLPQYD--GNSLLIQDQAVFEALREKKQVIESVMNVFLHDPILLDQO	3860
BREMIA	LIPFRYRQMEAVLPQYD--GANLVQDQAVFDALRSKRQVIESVMNVFLHDPILLDQO	3843
AEDDES	MVPRRLRQVPEGLAKPIG--TSGMMSKCMVYTRCLRDRSKRLRSCLOVFRBPTVDGLE	3894
MIDGE	LVPRLRSHVNVVEPLG--VNGMKRKNMNVHRCFRHFSQTLICLEMVFRBPTVDGLE	3912
BOMBUS	LMPRLRQVPEGLAKPIG--EKDLKRTIHTLQAVRNQDQPLSCSDVYVHEP-LMTE	3739
ANT	LVPRLRSHVNVVEPLG--ERDFLATIHTHARALRNDQDQPLACMDIYVHKP-IRSF	3817
WHIPWORM	LMPRLRQVPEGLAKPIG--VNGLLRSSMWNFLRSIRDNQGLLLNANDVFIKQPSLDVTR	3862
TRICHIANELLA	LMPRLRQVPEGLAKPIG--MHGLESTMYKYLKAFRDSYVILLNMDVFIKQPSLDVTR	3868
BEEFLE	LVPRLRSHVNVVEPLG--ATGLFRIMVHCLRSLSNSASLLSTMVVFRBPTVDGLE	3707
BARNACLE	LVPRLRQVPEGLAKPIG--PAGLRHTLLRAVRLRSSRHLAAALQVFRBPAQVTE	3761
THRIP	LIPRLRPHIVVLPQHD--TKGLIQTVMVHALRALRADPEILLATMVVFIKQPSLDVTR	3802
FLEA	LIPRLRPHIVVLPQHD--AFGLIQRVMVHALRALRADPEILLATMVVFIKQPSLDVTR	3793
WHITEFLY	LIPRLRPHIVVLPQHD--EFGLIRESMVSALKCKDNQHVLLATMVVFIKQPSLDVTR	3882
TICK	LMPRLRQVPEGLAKPIG--KEGFLASAMQDALRALRAGAESLIDLVVFOEPTVDVNR	3815
TERMITE	LMPRLRPHIVVLPQHD--ETGLFRETMIHCLRTLRNNYDMLLATMVVFIKQPSLDVTR	3886
DAPHNIA	VVPCRLRQVPEGLAKPIG--LNGSVRDSMVHTLRVAKAESGSIILAAISVFIKQPSLDVTR	3568
OSTREOCOCCLUS	LVPRLRSHVNVVEPLG--ARTWLEPTMARTVKALRNGSLLKGVMDVFIKQPSLDVTR	3839
STENTOR	LMPRLRQVPEGLAKPIG--PQGLERKOSMILICLAKRKHSLIDCLCVFRBPTVDGLE	3530
KLEBSORMIDIUM	LVPRLRQVPEGLAKPIG--ETDLKIDMTVRVTVLRENKQVLAVMVFIKQPSLDVTR	4192
CLUBMOSS	LIPRLRQVPEGLAKPIG--SLGLLKNMVRVLSALHKSQRQICAVMDVFRBPTVDGLE	3803
MOSS	LVPRLRQVPEGLAKPIG--AVGLLRSDMVRIMTALRGRSLISAVMVFVKEPLVDVQK	3970
LIVERWORT	LIPRLRQVPEGLAKPIG--ALGLRDTMVHTLAALHARREVLISAVMDVFRBPTVDGLE	4035
LIGNANO	LVPRLRQVPEGLAKPIG--PSQGFVRCGLGCLALRRERELVLSQVFIKQPSLDVTR	4290
COPEPOD	LVPRLRQVPEGLAKPIG--THGLFRETVMVQVLRCLREHPEMLISALNTVLOEPTLDVTR	3766
GLOBOSUM	LVPRLRQVPEGLAKPIG--VQNLNVHPMNTLAAIEEKDGLINALNFIKQPSLDVTR	3773
PALUSTRIS	LVPRLRQVPEGLAKPIG--IPVLEPYMIVNLTALRNRKQVLLANLFIKQPSLDVTR	3838
NEOCALLIMASTIX	MVPRRLRQVPEGLAKPIG--ISVLEIPMIYITVLRNENSIILANLFIKQPSLDVTR	3945
GLOMUS	LIPRLRQVPEGLAKPIG--SKGLEYPMIKILQIMANKDILLNMDVFRBPTVDGLE	3956
LOBOSPOR	LAPRLRQVPEGLAKPIG--TKGLEHPMVCIKALAKKQVILLNMDVFRBPTVDGLE	3932
SYNCEPHALASTRUM	LVPRLRQVPEGLAKPIG--VTGLEPTMTHIKAFRSEKSLLLNMDVFIKQPSLDVTR	3914
FUNCTIVORUM	LMPRLRQVPEGLAKPIG--ADGFLKMTVYTLALRKHKSKKILLNMDVFIKQPSLDVTR	3595
HALBUM	LMPRLRQVPEGLAKPIG--SVGLLSHNHTHTLAIHNNKDFLLSTMDVFRBPTVDGLE	4050
DPURPUREUM	LMPRLRQVPEGLAKPIG--SVGLLNNHTYLSALSHKDKILLNMDVFRBPTVDGLE	4057
PVIOLACEUM	LMPRLRQVPEGLAKPIG--SVGLLNSMTYTLGALSHKDKILLNMDVFRBPTVDGLE	4050
AMPHIPOD	LMPRLRQVPEGLAKPIG--TKGLIRESMVSALQALVSNKVVILAAVFAVKEPTVDGLE	3986
SHRIMP	LMPRLRQVPEGLAKPIG--QVGMLEKIMVSALGALRSHRVILTALEAVKEPTVDGLE	3957
MUDCRAB	LMPRLRQVPEGLAKPIG--PVGMKIDMVAVLGLRSHRVILTALEAVKEPTVDGLE	3948
TARDIGRADE	LAPRLRQVPEGLAKPIG--VKGLLQOTMVHAMRALRAERQVILLATMVVFIKQPSLDVTR	4005
HYDRA	LVPRLRQVPEGLAKPIG--DVSPYKQSMIVVLAQALQHSKMLISTMDVFIKQPSLDVTR	3852
SALPINGOBECA	MIPFRYKQIRGVLPQHD--KEGLVQEVMMVHVRALRANQVILLSTMDVFIKQPSLDVTR	4088
SPIDER	LVPRLRQVPEGLAKPIG--VKGIVYATMIHALKAIKTRKRDILLNMDVFIKQPSLDVTR	3979
LIMULUS	LIPRLRQVPEGLAKPIG--EKGLYEATMIHTMALRKHNDILLNMDVFIKQPSLDVTR	4043
SCORPION	LVPRLRQVPEGLAKPIG--EKGLYEATMIHALRKHNDILLNMDVFIKQPSLDVTR	4001
ROTIFFER	LVPRLRQVPEGLAKPIG--QRLGESSMVICLALRENNDLVCLLDVFIKQPSLDVTR	3946
CIONA	LVPRLRQVPEGLAKPIG--AHGELRHVMVRCLSALRSRTDILLPLDVVFIKQPSLDVTR	4031
OCTOPOUS	LIPRLRQVPEGLAKPIG--TKGLFERTMVHCLRESLRSKDKILLNMDVFIKQPSLDVTR	3913
CAPITTELLA	LIPRLRQVPEGLAKPIG--EKGVIEGTMVHSLRALRKHOKLISTMDVFIKQPSLDVTR	3992
LIMPET	LMPRLRQVPEGLAKPIG--IKGLIENMIHTLALRQDYDLVLLNMDVFIKQPSLDVTR	3972
SCALLOP	LMPRLRQVPEGLAKPIG--VKGLESTMVHARALRREDYDILLATMVVFIKQPSLDVTR	4061
LINGULA	LMPRLRQVPEGLAKPIG--EKGLESTMVHARALRREDYDILLATMVVFIKQPSLDVTR	4004
OYSTER	LIPRLRQVPEGLAKPIG--VHGLMESTMIHTLALRNNCDLLNMDVFIKQPSLDVTR	4004
SNAIL	LMPRLRQVPEGLAKPIG--VKGLENTMIHTLALRNNCDLLNMDVFIKQPSLDVTR	4011
SPONGE	LMPRLRQVPEGLAKPIG--VSGQLRSCMIHTLALRHSPTLLNMDVFIKQPSLDVTR	4049
PRIAPULA	LMPRLRQVPEGLAKPIG--LPHGQRNGLLYQTMVHTLALRDNHRLILLNMDVFIKQPSLDVTR	4049
DANTO	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHSLRAYRSDPDLNMDVFIKQPSLDVTR	4006
ESHARK	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHSLRAYRSDPDLNMDVFIKQPSLDVTR	4028
BSHARK	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHSLRAYRSDPDLNMDVFIKQPSLDVTR	4021
XENOPUS	LMPRLRQVPEGLAKPIG--DSGLPDSVMVHSLRAYRSDPDLNMDVFIKQPSLDVTR	4033
STERLET	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHSLRAYRSDPDLNMDVFIKQPSLDVTR	4037
GAR	LMPRLRQVPEGLAKPIG--VSGLISSVMHARALRAYRSDPDLNMDVFIKQPSLDVTR	4034
HUMAN	LMPRLRQVPEGLAKPIG--ETGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4015
PLATYPUS	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4022
TASDEVIL	LMPRLRQVPEGLAKPIG--ETGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4027
COELACANTH	LMPRLRQVPEGLAKPIG--EQGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4034
CAECILIAN	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4030
CANARY	LMPRLRQVPEGLAKPIG--EWGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4023
OSTRICH	LMPRLRQVPEGLAKPIG--EWGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	3993
GECKO	LMPRLRQVPEGLAKPIG--ETGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4033
TURTLE	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4031
ALLIGATOR	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	3991
APLYSIA	LVPRLRQVPEGLAKPIG--VKGQESSMCHVLRALRSDPDLNMDVFIKQPSLDVTR	4078
TRICHOPLAX	LMPRLRQVPEGLAKPIG--ENGQLKCSMVHTLALRKNPDLNMDVFIKQPSLDVTR	4021
SOFTCORAL	LMPRLRQVPEGLAKPIG--VSGLOSTMVYTRALRNNHILLNMDVFIKQPSLDVTR	4033
STONYCORAL	LMPRLRQVPEGLAKPIG--KSGTLOSVMHTLALRNNHILLNMDVFIKQPSLDVTR	4060
SEA ANEMONE	LVPRLRQVPEGLAKPIG--ESGLVRYNMIHVMRALRNNHILLNMDVFIKQPSLDVTR	3999
SEACUCU	LMPRLRQVPEGLAKPIG--IDGLKNTMVHCLRALRNNHILLNMDVFIKQPSLDVTR	4027
LANCELET	LMPRLRQVPEGLAKPIG--ESGLIYSVMVHARALRAYRSDPDLNMDVFIKQPSLDVTR	4093
STARFISH	LMPRLRQVPEGLAKPIG--KEGLIYSVMVHTLALRNNHILLNMDVFIKQPSLDVTR	4082
SEA_URCHIN	LIPRLRQVPEGLAKPIG--IDGVLQSTMVHTLALRNNHILLNMDVFIKQPSLDVTR	4063

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	IGKNKGMSEDFRQLEE----QSKI-EEQVY-----NRTGDSPSMISQDQKIK	3891
TETRAHYMENA	LTKDKKMGTIMFSENIG--HLDSTKTYNAEQ-----SQSQOQVGLSTMEASQIA	4290
STYLONCHEIA	DAKQKQKNGEN--NDNG--MVDSLISE-----YEEELQE	4145
APHANOMYCEsa	QSKTKSKAQ-----QKETPDGDEAAAA	3686
APHANOMYCEse	TVKKKSRRD-----K---DQKDENAS	3605
PTHUIM	STTTTHQREIFETNQEVTQEVE-DVAMEVEEVVKPSKRQKRSTMTPTSSSSSSGGQTATT	3955
PLASMOFARA	SIKIKQKVLFKKIVNVDLHTSHDSNAVKDVFETFA-PTRES--QSRKKASTLPATGNLT	3916
BREMIA	STAMHQKVLVFESVTEGDTSTFHDSDAEMEDVQESA-DFR-----SNKNGTASTARGIAN	3896
AEDES	AAQRRFVQEEA-----KPE	3908
MIDGE	GSKMKKNLEMA-----NVSMGI	3929
BOMBUS	HLNKALESSE-----DVID	3754
ANT	SINDDEIMKDD-----NDID	3832
WHIPWORM	EALKQTK-----LSDSSSAEGR	3879
TRICHINELLA	FARRQIGERT-----LWNDEANLRDS	3890
BEETLE	HASRFSTGV-----DTSN	3720
BARNACLE	HQQQPA-----	3767
THRIP	LAKKHWESEEN-----AN	3816
FLEA	PIKMYVRSSENE-----ALNYTDSISSIVEN	3820
WHITEFLY	NAHRLAQKQSGES-----DGS-KRSRNYFKDA	3908
TICK	LAKRQQAQSSPQ-----AS-KRQRGAREVS	3839
TERMITE	FASRHESLN-----KKSHEES	3902
DAPHNIA	EAEKMTENRFOA-----TPTKES	3586
OSTREOCOCCLUS	EALVASESSK-----	3849
STENTOR	PLKTSYI-----VSEE	3541
KLEBSORIDIUM	ESLKRRAALGAKGRK-----GAVANLRDGED--EQMEVL	4225
CLUBMOSS	EAARTASIRG-----GEEESH	3819
MOSS	EAVKLQARARADVSK-----STALEADAGANH--HMAAFS	4003
LIVERWORT	EAMKTSNFR-----DRKGA--EMESTF	4057
LIGNANO	LAGMLTAAHRESSAAWDTSEHRAG-----SKSASASSAAAGGSSIASFSCP	4337
COPEPOD	SANLEARNKKIK-----KKEEDH	3784
GLOBOSUM	FAKLQMQRQGGTV-----AISSM-SDSLAA	3798
PALUSTRIS	FALSOAQKQKTSQ-----DTSGSSENILNP	3864
NEOCALLIMASTIX	FALRQAQKQKIKPKEEE-----ESINTLEP	3970
GLOMUS	RANDQAQKQKDRNSNE-----IGEGDSQT	3980
LOBOSPOR	YATNQAKEQKRRGADM-----DSFEDDSIAP	3960
STYCEPHALASTRUM	RAMSQANHKRDRNSQGS-----PASDISSVTSSDAE	3946
FUNGIVORUM	LAKRVAKDQGGD-----DSS	3910
HALBUM	LASRLGKEQGGK-----HKS-V	4066
DPURPUREUM	LANRLVKEQGGK-----PKDTK	4074
PVIOLACEUM	LANRLVKEQGGK-----PKDTK	4067
AMPHIPOD	FVKLQEDV-----VDQEG	3999
SHRIMP	FVQKQEGD-----TQDSK	3970
MUDCRAB	FVRELEGN-----LDESK	3961
TARDIGRADE	AARKQSPDAD-----SQEE	4020
HYDRA	NAKKYESLALL-----KESS	3867
SALPINGOECA	QA-----RGD	4093
SPIDER	LANKQKQTMGMP-----NEGK	3995
LIMULUS	WAQKQRN-EG-----KASEDAHD	4061
SCORPION	NALKQKRIKQKVDENVDS-----INIYPGNTESDDPNHSFCD	4039
ROTIFFER	SAVKIAXKNLNE-----DMEITL	3964
CIONA	FGKRSRQDQRY-----SDSDVESSD	4052
OCTOPUS	NARNNMHRKAQD-----FSEED	3931
CAPITELLA	AAKKEIQAMSNR-----KEDTSKLTLD	4014
LIMPET	FAEKQRNEMLM-----TADDEE	3989
SCALLOP	NAEKQIQSLNLG-----D--SLEVEN	4080
LINGULA	FAEKQLQTTM-S-----QEDKED	4022
OYSTER	NAEKQMNEMK-V-----VSPEDE	4022
SNAIL	FAERQMRGGM-G-----KDADED	4029
SPONGE	NAKKQALAQ-----KINTDD	4064
PRIAPULA	TAERLADKDIHSN-----ESDQGEQV	4070
DANTIO	FELKQLKGGTW-----TESVNTKE	4026
ESHARK	LELKQMKKGGTW-----NKDVNTRE	4048
BHARK	FELKQLKKEGWSW-----SKDVNINE	4041
XENOPUS	LELKQMKKGGEW-----KKAVDVTS	4053
STERLET	FELKQMKKAGSW-----SEAVNTNE	4057
GAR	FELKQLKGGTW-----KETVNTKE	4054
HUMAN	FEQKMLKGGGSW-----IQEINVAE	4035
PLATYPUS	FETKMLKGGTW-----TRAVNTAD	4042
TASDEVIL	FEQKMLKGGGSW-----TREVNTME	4047
COELACANTH	FELKQLKGGGSW-----TKEVNTKE	4054
CAECILIAN	FMLKQLKKGQTW-----TKKVNTAE	4050
CANARY	FEQRQLKGGTW-----IKEINTSE	4043
OSTRICH	FEQRQLKGGTW-----IQEINTSE	4013
GECKO	FELKQLKGGTW-----FKQINME	4053
TURTLE	FELKQLKGGTW-----SKEVNTAE	4051
ALLIGATOR	FELRLKKGQTW-----LKEVNTCE	4011
APLYSIA	LAERQMNKEGES-----EDAED	4096
TRICHOPLAX	FANRQNAQGL-----KTESDD	4038
SOFTCORAL	FARKQAEKQKLN-----LNDMTD	4051
STONYCORAL	YARKQAKTQGI-----NEEEQK	4077
SEA_ANEMONE	FARKQAEQDQHE-----IGMYED	4018
SEACUKE	FADKTAQKQGL-----EISSD	4045
LANCELET	FAAKQMDKG-----MVGEDDLDD	4112
STARFISH	NASKQAQKQDAGRVLG-----QSDPDGNSLD	4110
SEA_URCHIN	FAVKQADYQKLS-----EDSRD	4081

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	FTWYPRKIDIVHKKLIGVHSLILLFDESRRH--QSA---RY--ADNLRKAIQ----	3939
TETRAHYMENA	DLMIHQRIIDIVKLLIGMNSHLFTELSSTRH--RTG---NY--FQHLKSALK----	4338
STYLONCNCHIA	LAWYPRKLEVMKDLNGLNVRIMAKELQDSKH--EKK---PY--FKVILNAIK----	4193
APHANOMYCESa	ATWMPQVKMDLARRKLRGEBVHLLCDELALNPN--VAA---V--LKLQATLP----	3733
APHANOMYCESe	SSWLPELKNQLOQRKLRGEBVHLLRELEQLNPH--IAS---V--YSHFDQIIP----	3652
PYTHIUM	LAWLPDVKVAIARRKLEGFSEKALLKELEAQNPH--LGK---Q--LKLFOALVD----	4002
PLASMOPARA	TAWLPNVKIAIARRKLEGVSEKALLKQELSONPH--IKQ---H--LNKYSLVN----	3963
BREMIA	AAWLPDIKIAIARRKLDGISKALLLKELESONSH--LTH---H--LSKFYALVD----	3943
AEDDES	LRWDPQARINMAVRKLANGAEKVLIAEELRIGQV--GCNRE--ILEGYKLL-----	3956
MIDGE	SDWNPEQRIAIVERKLRGEBVRRVKDEMSVSEI--AMNKO--LYDAYCNLA-----	3977
BOMBUS	VKWPFRKEAVFKLNGIKSLITLLEKLSQHH--DKYFD--RY--YAVITGDD----	3803
ANT	LIVSSKRHEIVAKKLNHISIIITLHLEKAHN--DEYFA--RY--CAIVTGDK----	3881
WHIPWORM	LSWYPKQKITVARRKLDGDESVIMEABL--SARQ--HTDNF--PLQQILCCIYGADEFFE	3934
TRICHIANELLA	FKWYPEEKISAARLRGDEVIIMQDELMSRR--HLSSP--PLHQIINCIIYGGKDFSA	3946
BEETLE	CDWYPAQKIEQARRKLAGANSVNIIMEDLAGHQ--KNQAY--MK---AYIALVE----	3768
BARNACLE	--EHARRVTRGRRLCGSHAAVCOELLAGAGR--LSAQE--VE---AWSAAAR----	3813
THRIP	PAWLVPVKHQAKKIKGTIVHLMREDESKIH--TVFKD--G----YKTLN-----	3862
FLEA	EQTMAHLKLRMARLKLQGSVHVLQDELKHSFV--STINE--IY--VNHIEKGM-----	3870
WHITEFLY	QDSFSLRHELEAWKLEGGHEIIMIKLEAGHK--TSPYL--DA--FKKILQ-----	3955
TICK	LDWFPKQKIVSROKLEGGHESYLRLDELKLRKT--NQPDF--AS--LELVCL--GAP----	3889
TERMITES	QTWYPOQKLDLAKLLEGANVITITTELEKAGFK--DSKYL--AK--F--LECVKGNH----	3952
DAPHNIA	TNWSPTQIVGRTDNLNGPHSVITCOOLENKI--FLTAGGQKL--LPQLIAVVR----	3638
OSTREOCOCCLUS	--SHLQSRITHEWGLKLELDNVEKLEASRQI--DR---SY--WTMCEBALV----	3995
SPENTOR	FADIPSKRHEIVAKKLRGEBVHLLRELEKSH--ANIS--NI--QDRIAEAVL----	3589
KLBSORMIDIUM	EOHVSLKLENAARKLARWNAEVTPLAQOSMV--NGK---PP--FRSLEGIVR----	4273
CLUMBOSS	EQQHVELKLENAQRKLDLWNAHVTLGELQSSVH--AGT---PW--MHATEAVAL----	3863
MOSS	EEHVQLKIVETAQCKLDLWNAEITISLELGSVH--ANK---PY--TRALEIIVR----	4051
LIVERWORT	EQQHVELKLENAQRKLELWNAEITIAELRSSVH--ARK---PY--SKALESIVR----	4105
LIGNANO	ERWFSKELQVVRQKLSGAEVCOELKSELDRH--RGK---PY--TSGMLAV--I----	4384
COPEPOD	REEFPKQKIVGTRRKLGVHESIIITCELELAGVD--KSD---W--LNKLVSAVE----	3830
GLOBOSUM	PEWYPKQKLEIARRKLDRENEFITADELKNHGE--KKK---W--YKNMRVTLM----	3845
PALUSTRIS	PEWYPOKLDIARRKLEGDNEPIYITTOLEWGHG--EKP---W--QAVRDVVM----	3911
NEOCALLIMASTIX	PKWYPKQKINIAERKLEGENSNLITTELENGHS--NTT---F--LRYLKEIVK----	4017
GLOMUS	VEWYPOKLDIARRKLELWNAEIVCSLEAGHS--NKP---W--FNSIKIAK----	4027
LOBOSPOR	PAMYLOQKMDIARRKLEGHEVYITVOELMNGHA--NKP---F--LAATKIAM----	4007
STYCEPHALASTRUM	LAWYPRKLEIARRKLAGESVYIVAVTRNDSPHKA--A---I--DRLEBVLV----	3995
FUNGIVORUM	QAWFPKXKLEIAKKLQGENAHITALELKSVEH--ANA--PY--LPHLOQIVM----	3958
HALBUM	ESWFPKKEVDIARRKLERWNAEYITSELEANSVH--KGQ---IY--EKSQNVVK----	4114
DPURPUREUM	NVWFPKQKLIHAKKLDLYNAEYITLEELASVH--SNS---PY--EKNLQELIK----	4122
PVIOLACEUM	NEWFPKQKVALAKKLEMYNAEYITLEELAGSVH--NGL---AY--DSALQLITK----	4115
AMPHIPOD	IQSYSSMRKIKITKLDGVNHCIIIDW--MKNRR--IPQNV--K---SVLSKIIM----	4047
SHRIMP	VELFSSKRELLANDKLSDIWNAEYITLWVSNKFP--VAK--Q--KA--YENLKQAVL----	4019
MUDCRAB	IEMFSEERKCLKEKLTGFBAYVTWV--LSKNKA--VRRDP--TA--FEELKRVVL----	4011
TARDIGRADE	LLWYPREKIDTAERKLRGGNAFITRTVRSNTP--LKSQD--RL--LAKVEDACI----	4070
HYDRA	PDWYPKQKINICKOKLANGVNAEITSELENSFL--HTRD--QLL--LESYISVVE----	3917
SALPINGOEA	VALFAEQKIAVARRKLAGDNEAHITLSELESNRH--VTSDR--SW--HRKAKDIA----	4143
SPIDER	DDWFPKQKLLIARRKLEEFNHCYITRKELELGHG--MRP---C--FQNMVSVCI----	4042
LIMULUS	TQWYPKQKIVFAQKLRGHEVYITRKELELGHG--MRP---C--FQNMVSVCI----	4102
SCORPION	FWWYPKQKLEIARRKLAGESVYITRKELELGHG--NKP---I--FQRLTDVCL----	4086
ROTIFFER	GLQYAKRDNVSKKLPGMHESVIMRNDLCSGIH--KDS---KY--LQYVVDVLM----	4012
CIONA	RWVYARRKMAITKXKLEGENSITCDELELNHST--ITK---F--KSYCCIAS----	4099
OCTOPUS	LSWYPKKIDFVKKRLDGEBHAYITRDELNLNSH--VRKS--DA--LESITSIVL----	3980
CAPITELLA	SQWFPKKEVNVVRKLEGENSHVMRAELALQQL--GSY-----LKYFVIVLM----	4060
LIMPET	STWYPKQKIQYALRKFPGDNECHITKDELYLGHG--RSP---A--IKHFECVVL----	4036
SCALLOP	ITWYPKKIVHVKRKLGEHESYITRDELELGHG--KND---F--LRNFESVVM----	4127
LINGULA	AKWYPKQKIVAFARRKLAGANWCITRDELELGHG--RRG---KT--YQAFIA--I----	4068
OYSTER	VQWYPKKIEVVRKLRGDNVCSITRDELELGHG--KKP---A--FPALERVLQ----	4069
SNAIL	MRWYPKQKIEITAARRKLDGNEHYITRDELELGHG--RNQ---A--LKDFERVAL----	4076
SPONGE	NWYYPKKEVNICRKLKLGPNESHMLIDLEHGFK--NKP---E--FKYLGKILL----	4111
PRILAPULA	QEWYPKQKIVGARRKLEEFNHCYITRKELELGHG--RHE---A--LKQMTNVVL----	4117
DANIO	INWYPLQKIVNFAARRKLEGTNSVITSELELGFH--KMP---E--YKGLLAVAR----	4073
ESHARK	IHWYPMQKIVRYARRKLEGANAAITRDELOLGHE--TTE---A--YKSYVAVAM----	4095
BHARK	INWYPRQKIVNYARRKLEGANAAITRDELOLGHE--KSK---A--YASYVAVAM----	4088
XENOPUS	HNWHPQKILHCARRKLDGANACEITCELELGHG--SAP---E--YKDFIAVAR----	4100
STERLET	INWYPMQKIVNFAARRKLEGANAAITSELELGFH--KSP---A--YQSIIVAVQ----	4104
GAR	IDWYPRQKIVQARRKLEGANAAITSELELGFH--KES---W--CRAALAMAQ----	4101
HUMAN	KNWYPRQKICYARRKLAGANAAITCDELLGHG--KAP---A--FRDYVAVAR----	4082
PLATYPUS	TNWYPLQKIVYARRKLTGTNSVITCDELELGHG--KVP---A--FGDYISVAR----	4089
TASDEVIL	MNWYPLQKIVNYARRKLAGANAAITCDELLGHG--KVP---A--FECVSVAVQ----	4094
COELOCANTH	VNWYPVQKIVKGRKLEGVNHSVITCNELELGHG--KLS---A--YQSYLAVVK----	4101
CAECILIAN	KNWYAVQKIVNCARRKLAGTNSVITCDELELGHG--KSV---A--YKEMKAVAM----	4097
CANARY	VNWYPLQKIVNYARRKLTGANAAITCDELELGHG--RSP---A--YNDFAVAR----	4090
OSTRICH	VNWYPLQKIVNYARRKLTGANAAITCDELELGHG--RSP---F--FSDFAVAR----	4060
GECKO	VNWYPLQKIVNYARRKLAGANAAITSELELGHG--KSS---A--YRYVSVAR----	4100
TURTLE	INWYPLQKIVNCARRKLAGANAAITCDELELGHG--KSP---A--YKSYVAVQ----	4098
ALLIGATOR	VNWYPLQKIVNCVRRKLAGSAAITCDELELGHG--KSL---A--YRDYVAVAR----	4058
APLYSIA	DNWYPKQKIQFARRKLRGDEHYIMKELELALGHG--KRP---A--FKSLVNVLM----	4143
TRICHOPLAX	FSWYPREKIVTFARRKLAGANAFVTRDELRLCHH--LSI-----LESFAL----	4081
SOFTCORAL	LAWYPKKELNSAKRKLGEHAEIMKODESCHK--KAG---Y--YEEMLSVLL----	4098
STONYCORAL	ADWYPKQKIVQSAWRKLEGFHAYVMRDLQLGHS--KQS---W--YKQMESVCL----	4124
SEA ANEMONE	LTWYPREKIVLTAQRKLAGANAFVTRDELGHG--RRS---W--FRNLQSACL----	4065
SEACUCIE	ALWYPKERLLIAAKLEGANAAITRELEKSVH--GKS---TS--LQKFIIVR----	4093
LANCELET	ISWYPREKIKFAAKLQGVNHTHTKAELELGHG--NLP---W--FKSFCLVAM----	4159
STARFISH	ISWYPREKIVNFAQKLEGANSDITQRELELGHG--RNP---A--PSAIKEVVK----	4157
SEA URCHIN	ISWYPKKIKFAAKLQGVNHTHTKAELELGHG--SKDARDAP--FLKALKSTC----	4132

Supplementary Figure 6 CLUSTAL OMEGA ALL PHYLA, EXPANDED

PARAMECIUM	-IINQNRLRHQY-----QKHOTLSVIGVNDCHLDLADPNILIRAVKIAEPI	3986
TETRAHYMENA	-EKPK-SIRNOY-----NEKQFLEVHEVNDCHLDLADPNILIRAVHIAEPI	4384
STYLNONCHIA	-SQES-SIRYKLLA-----QNRRLYEVDFIDCLTQSRDPNILIRVTWIDSEIV	4241
APHANOMYCESa	-P-P-----AA-----PKHSVLSVPDIAKALIHVIAAPNVILGRMIFHNSNA	3773
APHANOMYCESb	-VPS-----DV-----PKHGLSPLDIAKALIDIMDANVILGRMIFHNSNA	3693
PYTHIUM	-IANAQASTASS-----TTSGAMSSLAQAQDLALASAPDILIRTFQGMIBWL	4049
PLASMOPARA	-AASGTED--GA-----DEIAAALSSLEAQAQLLAINAPDILIRTFQGMIBWL	4008
BREMIA	-AASFGDIDERD-----NEVTTLSLGAQAQLLAINAPDILIRTFQGMIBWL	3990
AEDDES	-QVSDP-----LL-----ESGNLTVEQVQGLKTNVSGAVLITVAGMFBWF	3998
MIDGE	-IGDENMFRSQI-----GERKLSVEDVQGLHEMADKAILIEMVILMIDPFI	4023
BOMBUS	-LIKRTKAK-----LNGFLTPEBETELLDQADNDNLILIRTVWIKRML	3846
ANT	-ELKQARSQPCIT-----GNDHITPAQVVDCLDQAKDLITLGRMIAWQSL	3927
WHIPWORM	I-NETRRNAPRGY-----SSRSLSVDDVNSLHLELVPLVLRVTHHEBFI	3981
TRICHINELLA	L-SEEDQSAPRGY-----PLQALTVEQVQGLHEMADSVLIRTVIFHEAHI	3993
BEEBLE	-GNSDFNVRAARL-----AGNGLSEEDIAICLDHMDNYLILGRMIFHMAHV	3814
BARNACLE	-GRRGHEPRAEL-----ADAGLTAEQVVDCLLELDNDRYVLCLAYSMAAHV	3859
THRIP	-GDASRNIRAKL-----GYNDLTPROQVECLDLDADPNVILKTVGGVEBWL	3908
FLEA	-GVEQHNIIRRI-----KMKDLTAKBOVDCLDLDADRSLILGCTVHGWDBWM	3916
WHITEFLY	-GTNESLRFKFR-----IDQELNANOVDLILLDQAKDKHILIRTVAGHEBWA	4001
TICK	-GVESRMRRRFA-----RGDKLSPRDVVDCLLEQADDPAILGLTWTGEBWL	3935
TERMITE	-SVRSQ-----M-----PSYQLLPEEVDVSLDQADNYLILKTVQGMIBWM	3993
DAPHNIA	-GNRSMILTSET-----IKRKVEPHSSRRASMPQVTECLTQSDPAQLSRMIVGEBFI	3692
OSTREOCOCCUS	-GSN-----AEP-----TSCKATVEBIVRCLDLDADPNILIRAVGHEBWL	3936
STREPTOR	-EPKQ-SLRM-----ANSVLSVDDVLDLEHEDPNILIRTVIFHSEIV	3633
KLEBSORIDIUM	-DPRVNIARAKV-----DKKICATVQVVECLDLDADPNVILGRMIFHNSNA	4320
CLUBMOSS	-DPVKNTRRRI-----DRKICASVEEVDCLDQADPNILIRLAVHNSHM	3914
MOSS	-DPSRNIRARV-----AGNVCSVQEVDCLDQADPNILIRLAVHNSHM	4098
LIVERWORT	-GSPDRNMRART-----MGNICQSIREVVDCLDQADPNILIRLAVHNSHM	4152
LIGNANO	-DRRRISVGGGD-----AAERLVPMQAEALLVDMADPALLARTVGGWQDL	4430
COPEPOD	-GERLSTSGKRR-----DALCDDTGLSPSDVDLILHOSDKNLLGRMIVGDBFA	3881
GLOBOSUM	-GDPVINIRAKA-----GNICQTPKEVVECLDLDADPNVILGRMIFHNSHM	3891
PALUSTRIS	-GEGKTRRSQV-----GRKCSVKEVVECLDQADPNILIRAVHNSHM	3957
NEOCALLIMASTIX	-GDPKYNIRAOPEY-----NEISDEGSNVLSPIQVVDCLDLDADPNILIRAVHNSHM	4071
GLOMUS	-GDPNINIRARA-----RQKCFVKEVVECLDLDADPNVILGRMIVGDBFA	4073
LOBOSPOR	-GDSLHNVRARH-----GRVCASVQATECLDLDADPNILIRAVHNSHM	4053
SYNCEPHALASTRUM	-GDEKHNVRARI-----GPVCSDTROVVDCLDLDADPNILIRAVHNSHM	4040
FUNCTIVORUM	-GSKHNIIRAKV-----GKCSVKEVVDCLDQADPNILIRAVHNSHM	4004
HALBUM	-GDPKHNIRAKA-----CQICSTAKEVVDCLDQADPNILIRAVHNSHM	4160
DPURPUREUM	-GDPKYNIRSKV-----NKICCSVKEVVDCLDQADPNILIRAVHNSHM	4168
PVIOLACEUM	-GDIKYNIRAKV-----NKVCSVKEVVDCLDQADPNILIRAVHNSHM	4161
AMPHIPOD	-SQD--EGRALM-----AKEGLSVPOVVDCLLELDADPNILIRTVIFHSEIV	4091
SHRIMP	-GDRGESVRAV-----GERGLSTHQVVDLILLEQADPNILIRSVIHWDBEL	4065
MUDCRAB	-GQNCESARANM-----DRTGLTIHQVVDLILLEQADPNILIRTVIFHSEIV	4057
TARDIGRADE	-GD-ADGVRAXH-----GDRHLEVEATECLDQSDENILIRLFSHNSHM	4115
HYDRA	-GSSQHNIRKLLDR-----TNNPEKFLTVEEVDCLDQADPNILIRAVHNSHM	3970
SALPINGOCEA	-GDAQSNIRATM-----PEHGLSVEDVVRCLDQADDPVILIRTVAGHEBWL	4189
SPIDER	-GDASHNIRAQL-----KKSGLSVEEKIESLDQADDPVILIRTVIFHNSHM	4088
LIMULUS	-GDEKHNIRAKL-----ADKDLTVEVDVVDCLDQADPNILIRAVHNSHM	4148
SCORPION	-GDRK-SLRNL-----PKNGLSVQVVDCLDQADPNILIRTVIFHSEIV	4131
ROTIFFER	-GNKLLSRNGLLERSKILAENGKYLITVEVVDCLDQADPNILIRTVIFHSEIV	4070
CIONA	-ID--TKNIRFLM-----PKSGLSVSEVVDCLDLDADPNVILGRMIFHNSNA	4144
OCTOPUS	-IT--EGNVRYTL-----POKHLTVEQVITNLDLADPNILIRTVIFHNSHM	4025
CAPITELLA	-GDKQADIRARL-----PADGLSSEEVANALDLDADPNILIRTVAGHEBWL	4106
LIMPET	-GDAKDNVRAATL-----PSTGLTVEQVVALDQADPNILIRTVAGHEBWL	4082
SCALLOP	-GE-RDDTRAQL-----PQDSLSEEDVVALDQADPNILIRTVAGHEBWL	4172
LINGULA	-IQGQDNTRTKF-----AEVDLTPEQVVALDQADPNILIRTVAGHEBWL	4114
OYSTER	-GDKRENVRAQL-----PASGLTVEQVVALDQADPNILIRTVAGHEBWL	4115
SNAIL	-GQVQDNIRARL-----KEKGLTVEQVVALDQADPNILIRTVAGHEBWL	4122
SPONGE	-GDSSTNLRARV-----GKRCDSVEDVVDCLDLDADPNVILGRMIFHNSHM	4157
PRIAPULA	-GDPKSNLARAQL-----PPEGLTVEQVQGLHEMADPESSLIRTVIFHNSHM	4163
DANTO	-GEEQHNIRAKL-----ADKDLTVEVDVVDCLDQADPNILIRAVHNSHM	4119
ESHARK	-GDEKHNIRARV-----PEDGLSEETVVKCLDQADPNILIRTVAGHEBWL	4141
BHARK	-GDKHNVRARE-----SEEGLSVEEVDCLDQADPNILIRAVHNSHM	4134
XENOPUS	-GDKKHNRRTNE-----PPDGLTEFTVQGLDQADPNILIRTVIFHNSHM	4146
STERLET	-GEEKHNVRARE-----APQGLSVETVVECLDQADPNILIRTVIFHNSHM	4150
GAR	-GEGQVNVRAQV-----AAEGLAVEIVVECLDQADPNILIRTVIFHNSHM	4147
HUMAN	-GSKDHNIRAQV-----PESGLSEETVVKCLDQADPNILIRTVIFHNSHM	4128
PLATYPUS	-GSKDHNVRARQ-----PEEGLSEEQVQGLDQADPNILIRTVIFHNSHM	4135
TASDEVIL	-GNRDHNIRAQV-----PDDGLSEETVVKCLDQADPNVILGRMIFHNSNA	4140
COELACANTH	-GDPDHNVRARE-----VKEDLPVETVVALDQADPNILIRTVAGHEBWL	4147
CAECILIAN	-GDKTHNVRARE-----PKDGLTEETVVKCLDQADPNILIRTVAGHEBWL	4143
CANARY	-GNSNHDIRAKE-----PEDGLSEETVVKCLDQADPNILIRTVAGHEBWL	4136
OSTRICH	-GNAAHNTRAKE-----PEDGLSEETVVKCLDQADPNILIRTVAGHEBWL	4106
GECKO	-GSKHNIIRAKE-----AEDGLSEETVVKCLDQADPNILIRTVAGHEBWL	4146
TURTLE	-GSDHNIIRAKE-----PEDGLSEETVVKCLDQADPNILIRTVAGHEBWL	4144
ALLIGATOR	-GTRDQNIIRAKE-----PEDGLTEETVVKCLDQADPNILIRTVAGHEBWL	4104
APLYSIA	-GKD--SVRAGL-----PAHGLSVEQVVALDQADPNILIRTVAGHEBWL	4187
TRICHOPLAX	-GDKQYNERARM-----PADNLSVEDVVTCLDQADPNILIRTVIFHNSHM	4127
SOFTCORAL	-GDKQHNRARH-----YVNTVENVVALDQADPNILIRTVIFHNSHM	4142
STONYCORAL	-GDRNANVRARE-----PESGLSVESVVSCLDQADANILIRTVIFHNSHM	4170
SEA_ANEMONE	-GDRRHNVRAQK-----EENELTSEAVDCLDQADPNVILGRMIFHNSNA	4111
SEACUKE	-GDHRVNIARAQV-----AREPSGLSVEDVVALDQADPNILIRTVIFHNSHM	4141
LANCELET	-GDDGKDVRAQK-----PAEGLSVEDVVALDQADPNILIRTVIFHNSHM	4205
STARFISH	-GDRSQNIRASS-----PKSGLSVETVVECLDQADPNILIRTVAGHEBWL	4203
SEA_URCHIN	-GNTESKRAQS-----KSKGLSVEDVVALDQADPNILIRTVIFHNSHM	4178

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