Supplemental Materials

Molecular Biology of the Cell

Holden et al.

Supplementary data for:

Involvement in surface antigen expression by a moonlighting FG-repeat nucleoporin in trypanosomes

Jennifer M. Holden[1], Ludek Koreny[1], Samson Obado[2], Alexander V. Ratushny[3], Wei-Ming Chen[4], Jean-Mathieu Bart[5], Miguel Navarro[5], Brian T. Chait[2], John D. Aitchison[3], Michael P. Rout[2] and Mark C. Field[1]*

Supplementary figure legends

Figure S1: Locations of trypanosome nucleoporins during the cell cycle. A broad selection of trypanosome C-terminal GFP-tagged nuclear pore complex proteins were analysed for their locations at interphase and during late mitosis. Cells were fixed and counterstained with DAPI to visualize DNA. Note the clear essentially exclusive nuclear envelope localization for TbNup98, and the repositioning to the spindle anchor site for TbNup92 in mitosis. TbNup53B displays intranuclear puncta during both interphase and mitosis. Scale bar 2um.

Figure S2: Comparison of the distribution of the FG-repeats (red) and coiled-coil regions (blue) among Nup53b proteins of kinetoplastid flagellates. Panel A: The distribution of FG-repeats (red) and coiled-coil regions (blue) is shown for proteins of kinetoplastids. Predicted proteins were identified by BLAST, and where possible also by synteny. Panel B: Maximum likelihood phylogenetic tree of TbNup53b and TbNup53a homologs in eukaryotes. Iterative HMMER searches were used to identify both the human Nup58/45/yeast Nup49 and human Nup62/yeast Nsp1 as probable orthologs of TbNup53b as well as of TbNup53a, suggesting they are all members of a single family of related proteins. The phylogenetic analysis assigned TbNup53b to the human Nup58/45/yeast Nup49 clade and TbNup53a to the human Nup62/yeast Nsp1 clade. The numbers indicated by the arrow to the internode separating the two clades are the bootstrap/SH-like LRT branch support values for the monophyly between the two subgroups.

Figure S3: Impact of TbNup53b RNAi on PCF and BSF cells. Lower panels refer to BSF and upper to PCF throughout. (A) Quantitation of TbNup53b mRNA in uninduced versus TbNup53b knockdown cells in PCFs and BSFs. At 24h induction, ~90% and ~40% reduction in TbNup53b mRNA is observed in PCfs and BSFs respectively. (B) TbNup53b knockdown results in a gross growth defect over a seven-day period in BSFs but not PCFs. (C) At 0, 24, 48 and 72 hour time points post induction, cells were fixed and stained with DAPI to visualise DNA. This allowed categorisation of cells into distinct stages of the

cell cycle. 100 cells were recorded at each time point and the mean scores of triplicate experiments (i.e. n = 300) are shown. TbNup53 knockdown disrupts normal progression through the cell cycle in BSFs but not PCFs. An initial decrease in 2K1N cells is observed, followed by an increase in unusual cell types at 72 hours post induction.

Figure S4: TbNup53b knockdown impacts on correct nucleolar positioning and spindle microtubule formation in BSF cells. TbNup53b RNAi was induced in BSF cells. (A) Uninduced and induced cells were fixed and probed with anti-β tubulin antibody (KMX) and anti-NOG-1 antibody to highlight the spindle microtubules (red) and the nucleolar protein NOG-1 (green). DAPI was used to visualise DNA (blue). Scale bar: 2μm. NOG-1 appeared to have an unusual distribution in induced cells. Similarly, the spindle microtubules were often undetectable using the KMX antibody in induced cells. (B) The number of nucleoli and presence of the mitotic spindle were recorded in 1K1N, 2K1N and 2K2N cells. Mean scores from triplicate experiments are shown (n=300). The number of nucleoli increased in induced interphase and mitotic cells, whilst the mitotic spindle was undetectable in induced mitotic cells.

Figure S5: TbNup53b is not required for TSR1 distribution. TbNup53b RNAi was induced in PCF and BSF cells. Cells were fixed and probed with anti-TSR1 antibody and imaged by widefield microscopy. The distribution of TSR1 within the nucleoplasm was indistinguishable between uninduced and induced PCF and BSF cells indicating that TSR1 does not require TbNup53b for nucleoplasmic localization.

Figure S6: TbNup53b knockdown does not affect whole cistrons. Genome wide RNA-seq profiles following RNAi mediated knockdown were mapped at GeneDB for genes upregulated. The vast majority of genes are observed as singletons, indicating the absence of a significant impact on an overall PTU.

Figure S7: TbNup53b knockdown does not impact on the site of SL-RNA transcription. SNAP-42 was genomically tagged at the C-terminus with a 12xcMyc epitope in TbNup53b RNAi cells. The localization of SNAP42::cMyc (green) was monitored in uninduced (-Tet) and induced cells (+Tet -24h, -48h, -72h) by confocal microscopy. TbNup53b knockdown did not affect the localization of SL-RNA transcription in PCF cells. For all images, DAPI was used to visualize DNA (blue).

Figure S8: Expression of genes contained within the procyclin locus are not affected in TbNup53b knockdown BSF cells. The relative expression of genes contained within the procyclin locus following TbNup53b knockdown in BSFs were validated by qRT-PCR. The steady state of individual mRNAs was not altered following TbNup53b knockdown at 48h post induction. Expression levels were normalised to β-tubulin.

Figure S9: RNAseq profiles for selected loci demonstrate specific impact on the procyclin locus of Chr X. RNAseq read counts are shown mapped to the 427 genome, with control profiles at top in light blue and 12 and 48 hours post induction as middle and lower profiles (dark blue). Positions of ORFs are shown beneath each system, with the conventional top strand in blue and the lower strand in red. GeneDB accession numbers are also indicated.

Figure S10: Changes in the procyclin protein levels upon TbNup53b RNAi. 1 x 10^7 cells were extracted by 2% CHAPS (90s 100°C, 15min 12000g) prior to SDS-PAGE. Procyclins were detected by monoclonal anti-EP antibody (Cedarlane) or anti-GPEET antibody and the signal intensities were measured using ImageJ. Right: relative change in expression following 48h TbNup53b knockdown compared to uninduced cells (dashed line). The standard deviations were calculated from three independent experiments. The relative intensity of the entire Coomassie stained lanes were used to normalize the procyclin signals.

Figure S11: RNAseq map. Combined datasets for 0, 12 and 48 hour RNAi and singefungin-treated cells mapped to the *T. brucei* 427 genome, and corresponding to the data summarized in Table S2. Full dataset available to view or download at doi: 10.6084/m9.figshare.5017019.

Table S1: Sequences and accession numbers of proteins used for phylogenetic reconstruction of the ScNup49 and ScNsp1 families.

Table S2: Protein identifications for TSR1 affinity isolation. The top 25 hits were considered and colored as bold; affinity handle, green; GFP, red; possible splicing/mRNA processing factor, gray; likely contaminants, light gray; Obado keratin, black; others.

Table S3: RNAseq raw data. Sheared cDNA synthesised from RNA extracted from TbNup53b uninduced and induced (12h, 48h post-induction) cells were sequenced by 76bp paired end Illumina sequencing. Reads were mapped to the *T. brucei* 427 strain reference genome and aligned to annotated transcripts. The FPKM's of annotated transcripts is normalised by quantile normalisation and the statistical significance for transcript level changes is calculated based on (FPKMtreat/FPKMparental) values against null distribution using *t*-test. In the filter column, '1' denotes a significant gene with $p<0.05$ and *vice-versa.*

Table S1. Protein sequences used in this study.

Species	Group	Source	Sequence
TbNup53b / ScNup49 / HsNup58/45:			
Trypanosoma brucei	Kinetoplastea	NCBI|XP_843946	MMSTAPTGGFGGFGAAAKGGFGAVTATGGTGFGTAATGSTGNFGGFGTATGSGF AAVTTTGTFGGFGAGKGFGTTVATPAQPHLPQYKGIKGPGSSTEWLHGVNLSILRD DVVFEDLPVPLQQHLTDFHNFIQAEHDAKQVVEAFLTDSATPNATPAPSYRELVKKM NQLASGENAVDGIRVECFEREVQAHRLGQTLDKCEDDILDYMKNVWKPLSEIDFTQ RAGGNRPKPASEPFQRILREIQGCMDAISAAVSELEAAVVPCGRRVRGPVTDDASR SNAAPEPPCASASEFLTKLTGGVELPDVPPPGLGSAASAHPVSRINASLSNQLTTLL NLAAWTLRLHTRADSARDLFVHNYGTSEAELLLAQQHQQAESSAGPRRPFLLPSST GAAAAEVNQDTVGDIHRRSAFPHRSKALSNGERKMQYDVLLERKYQTAAPAAAPLS TATASGTASSVAGATLGATSSTSTIATGFGAPQSLGTIGGATIFGAGTSAADPRKTLN KTGRS
Trypanosoma congolense	Kinetoplastea	NCBI|CCC89792	MSANVPVPGSADNRGASLGFGATPTAGMSGGFGGLGVGMKTGFGVNASSSTFGG ISINKGFGVPSAQPQIPPYKGIKGPGFSTDWLQKVNVSSLRDDVLFGDLPPPLQQHL MEIHNFIQAEHEAKQAVEAFLTDSTTRSIAGDAGYRKLVTQLSQLTGGENAVDAIRVD CFEREVQSHKLSRAMDRCEEDIHNYMKQVWTPLSGLDFTLPISGSRPRPSLEPFQR ALRETEECMKGLSTTIAELKASVVPGGHCQRGIVVDDKNNINSVADPSSSSAASVHS RLTSGLQPPHVPLALGLGVSAHPIVRIISSLSNELTALLNLAARTLWLHTRADNARDIF VHRYGAPEAELIFAQRQQEESSTDPRRPFALSSTAATSADVKQDTIGDIHRRRSACSH HSEALSDVGFRMQYDVLLERSQQNSVPTATTAPATSSAGPVAPATTFGAATAPSPA VPGMGFAQTSSLGTEAGARFGGRSSTTSASKRTLTNGYRS
Trypanosoma cruzi	Kinetoplastea	NCBI|XP_810452	MFKPGQASAGTGFAAAPAATAGKSASSGFGGFGANTVTTGGFGGNSTVGFSGFGA AKGFGTAAAIGGQAQVPSYKGIKGPGFSTDWARSVNFSTFRDDVLFEELPPPLQQH LMELHNFIQAEHDAKRFVESFLTDSIGTSAGDSSSYMELQKKLVQLTAGDNAVDAIR VDCFEREVQGQHLGMLLENCEEDVVQYSKHVWEPLAEQDFTQRLGGNRAELPSEP FQCCLREVQTRMEEMSAVLTELELAVLPNAQRQKRTTNNDKNTSNTTNTEPSASHF SRYTAEMKPLDTATGLRPTIASHPVVQMNTTLSNELATLLNLAAWTSRLHARADAAR DLFVHLYGSSEAEVLLAQQQWQMPVGPKRPFPLRSAEASSFSEPNHDTIGDIHRRS VGLDRLGALSNGERRMQYDVLLERQRQDSAPASVGTNTTGFAAPVAPAAAVAATA SAVPTLAGTTAGTTTTTASTAAAGFGASAPPATGTGGTTAFGAPLGTASSTRTANKK GRV
Trypanosoma vivax	Kinetoplastea	NCBI|CCC47107	MMFGSSQPAFSSAPGTNAGVATGATPFFGAVPPGVVGAGATSFGSFGANKGFGIT ATPGGQPQIPPYKGIKGPGFSAEWPRLVNLSTIRDDVVFEDLPPPLQHHLIELHNFVQ AEHTAKQFVKSFLADSVGPEPGAAASYRSLSKNLCRLLNGKNAVDGIRVDCFERES QSNRLGHILDKCEEEVHNYIKHVWEPMSEEDFTQRRTPSGSESSEPFFSALCEIQTY MKEVSSIVSELEAALLPDGRRRKVPGTDNDGKANAVLEQSRAALPHLSRFHAVSEP CEASAGSGSPAITNPVAQVNSSLNNELTALLNLATWTLQLHSRAEDARDLFVHMYG ASEAEILFSQNQQRNAIGPKRPFALPLRSKAATKEDGHTTIGDIHRRRSIGLDRLARVS SGERKMQYDVLLDRQRHVPLVGAPPTAPAGLNIPVASTAPAVTVGAAPTNFNTAPA LLGSTAPPSSRTGTGEFSRHVGKKGRQ
Trypanosoma rangeli	Kinetoplastea	NCBI|ESL12123	MFGLGQTSAGTGFATAPAATAGKSAPFSSVGTGATAAAPGGFGSFGTNTTATGGF GTSTVGFGGFSASKGFGTATAIGAQPQVPPYKGIKGPGFSNDWSRSVNFSTLRDDA LFEELPPSLQQHLMELHNFIQTEHEARLFVESFLADSVGAAAVVSSYRELQKKLAQL TTGENAVDAIRVDCFEREVQGQHLGMLLQKCEEEVVQYSKQVWEPLAEQNLAQRS GGNRTELPSEPFQRCLRDVQMRMEEVSAALMELELAILPSAQRQKRLTAADTNNTA NTTTELASSASPFSRYMAEMKPLDRASGLRPTMVTYPIAQMNTTLSNELAALLNLAA WTSRLHTRSDAARDLFAHLYGASEAEVLLAQEQRQLPVGPKRPFPLGSAETSSFSE RDQYTIGDIHRRSVGLDRLGALSSGDRRMQYDVLLERQRQAPAPAKSEPWGTAAV SGSPSATGFARTANKKGRS
Leishmania braziliensis	Kinetoplastea	NCBI|XP_001566428	MSLGGFGTGANAGGFGAKPAMATGFAATPSTGAGTGTPGPVNGGHRFGGFGTSA AAAGGFGAPLSAPGGFGAPAATGFGAKPGFGTAPATGGFGAGGGFGIGATTGGTG GFGSTATSSLGVGRGGGFGMAGGFGSTTAPAAPTAQQYPYQGIKGPGNATSWAR DIDFSQVTEQVRFEALPQPLQQHLMELRSFMHAERDAAKKVYLYFNESDDADSAAG AIATSATGSSSPTASSSSYRQLLAQMAALKGGGNRAVDLVAVHCNQHEGQTRRQL QRLEKLEANIRDYERHVWEPLLEQGLPSSLAGSGMNACGGAYRPAVSNGAASPFV ALVEELSHRMDHVSSALTELEATLVPPGRSLRGAGVGGCRGHHNGRAISNDAIAQIN AALVYELNQLRDSSSVAAHLHSRTDIARELFTRQYGQAEADVLFADTEQQRNGMTL FRRASPSTYFDIPPLPQQSQSPAAASAATTTMGITAPATGFGAGTTSALGGGIGATS GGGAFGAAPAAGAAGAATTGGFSAPATAAAAPAGGGVVGGFGFGATAPAATGFGA AAGGTTSTPAAGLATAVGGFGAAPTAGGFGAALASATAAPAATGAPPFAPSLGPAA PGSAPTVFNLGGGAAATGTGFGMAPGKSGIGGGDDRPSRRAR
Phytomonas sp. isolate EM1	Kinetoplastea	NCBI|CCW59601	MSFTFAAAPAASNQAGAQNNPKPNMLGFSSIPAASTTPMANTGFGTFNTGFMKPG GTFTSGTGISNTATGVGNSAGGFPSTTGFSSITTGFNSSTLNTNLTPQLPPYKGIKGP GYAKTWQNTVDFSQINDYTLFDSLPPTLQQHLMELYAFSSKEEESVRAVTDYLNDIK PIHTGKGTANSKMDTNSGSYRHQSRQLAELKGGSHAVPIVAVSCENHEKEAQSFSQ HLDQFESIIREYQHRVWEPLLASGNLTRAKNNNSTNNSLGSMNSFDHNVNAKSPLL SIVEELQGIMRTLSGQIEELKMNVMPSLTPNHLVNAADSAKQDRSLCNYASNVYLSH VDGRTPLYRNTSLNNYSNRCDRLQFCPSTFSPLGTTVTTGFSGSALEGDPTQSSEVI PQINASLMSLFTSLMNLSSWAGHLHKRTDTARGIFTRQYGQYEADVLFKPPIRSQET PTLVPGLSAPVLPAANPVAAAAPTTQMANFSVMNTATNTLQTAPAATPVGGFGSFG QGLVGSFGGWKTNPVR
Crithidia fasciculata	Kinetoplastea	NCBI|AODS01000155	MSFGGFGAKPATAAATGFGAAPATGGGFGSPAGGGFGSAGGGGFGAAAAPAATA TTGFGAPATAPTAGGGFGASAAGGGFGAKPATAAAPGFGAPTGGGGGFGSSATG GFGGGTSSGGFGAAPTTGFGAPAGGSGLGATMGTGGFGAGRGGFGVASTGTSGF GGMGAAAPAANAAPTAAQYPYPGIKGPGNSMSWAREVDFSQVTEQTPFESLPQPL QQHLIELRSFMHAERDATKKVYEYLNESDRSTSTQTSAAAAKAGAGDAAATSYRGL LSKLADLKGSGNCAVDLVAVHCNQHEGQARRQLQRIERLEASVRDYERHVWEPLM ERGLPQSTNGGSTSGLRGGMYRPSASSDAASPFVALVEELSRRLDSVSEELGALEA TLVPPGRPLRGVGSGERAGHRGGSAVPSDAIAQINASLLYELNQLRDFSCVAAHLH SRTDTARELFTRQYGQAEADVLFTDTEAQRSGMALFRRASPSTYFDIPPLPQLSAPT VAAAAAPAAGGFGAPAAPTATGGFGAGAGTGGFGGFGTKPATAPAAAAPATGGFG AKPSTATTTTATAAPAGGGFGFGAAAPATAPGTTASATPAAAPATMGFGAGPASGA

			AGAAPAPAATGFGGGFGAPAGGATAPAAAPAAPAMGPASPAGAPTSFSLGTAATG TGGFGAGLGKTAAEGDDRPMRRPR
Herpeto-monas muscarum	Kineto-plastea	NCBI| AUXJ01003408	MSFGFGGAAKPPATGGFGAAAAPAATGFGATAAPAATGFGATAAPATTGFGAAAA PAATGFGATAAPATTGFGAAAKPATTGFGAATGGFGAASGGFGGAAAKPMGGFGA ATGGFGASAQPQQPALPAAAQYPYTGVKGPGNATSWSQSVDFSQISNTTAFESLP PPLQQHLLELRSFMHAEKAATRAITAYLNEFSTEKPTYRALSKRLTTMNSGRNAVDA VGVRCSRRGREVDGFAKSLDQLEGNIREYRQRVWEPIAEGDGHRRHDTGTPSPSS SPSAQQPLVTLVEGLQQQMERIARQLQELEMDLLPSGSGSGNGLDGGLQVANRSL LASPLHSRGMTAGVRPLASSPVAGSEAAGDIAAQINVSLGNELAVLTNTSMWAARL HSRAEAARGLFARNYGDAEAGALFAPARAAVAGAKNVIFALPRLPAAAASPAPAAPT AAAGFGAATTGFGAAATTTGFGVKPTAATTGIGAAAPAATTGFGAAATAAPASTTGF GAAAAAAPAATTGFGAAATAAPASTTGFGAAAAAAPAATTGFGAVAPAAPAAGPAA APAPAAGGVAAGFSLGPGSPRFGPQATPAAGGDSDARPETRKRH
Strigomo-nas galati	Kineto-plastea	NCBI| AUXN01000936	MVLLVTFGAAPAAGGFGAAAPAAPAQGGFGAKAPGGFGGAAPAAGGFGAAPAGA PAPQGGGFGAAPAAPAQGGFGAKAPAQGGFGGAPAAPAPGGFGAAPAQGGFGA APAQGGFGAKAPGGFGAAAPAPGGFGAAPAPGGFGQGGGGFGQQSTGLLRGFG SGGGGVVAGLTNGQSYASGNPKPTVTAAQFPYPGLKGPGYDMAWVRTVDFAALTT GTLYESLPAELRQHLLDVFDFQRKEAEASQAIHRRLRSKSGFTDPPLSFLQLNTGPR SAKRVVAACHRRESDAQQLVEEINSFEREVRDYTQNVWAPLLDTHALDTPAGPVAP VLAGSNRTTRFTALLDMLSKAQSELEQDVQEFLQEVQQTRGAPGTATSVCEASDAIL QCLSRLDSACRRAAKSNAEVASMRGAYTQKFGAERANRIFVNVEEKDTPTIVLRRLP VPSAGFGVPPAGGGFGGALGGGFAAPAAPGGFGAKAPGGFGVAPAAGGFGAAAP AAPAQGGFGAKAPGGFGAAPAPGGFGAAPAAAAPAPGGFGAKAPAGFGAAPAAG GFGAAPAPQGGGFGAAPAAPAQGGFGGKAPAAGGFGAAPAAPAPGGFGAAPAQG GFGAAPAAPASGFGVKAAPAAAPGAPPSFNLGAK
Angomonas deanei	Kineto-plastea	NCBI| AUXM01000122	MSFGFGAAPAGGGFGKAPATGGFGAAPNAAPGAGGFGAAPAGGGFGKGPATGGF GAAPNAAPATGGFGAAPAGGGFGKAPAAGGFGAAPNAAPATGGFGAAPATGGFG KAPATGGFGAAPATGGFGGAPATGGFGAAPAATGFGKGPATGGFGAPLATGGLGA APGSAQTEVKYTGTAGPGYRATWDSQSELSQFSHTNPFENLPDPMRLHISDIFEFQ KAEAAAAEYIKDYFADFDNSESKSNYRTLMHKMDKLRRGQTSLPTLKAHTTELKNM ATSVNGSAGTLEREVSHFVKDYKSGSISNSTEPNLSVYFAREVDKIAENIDRLQDVA NELENNHVKGSGSLLANTENRDINALLNHLITVVSQYADRTSHLQQRAAEVQLAFIRR FGEAELAYLVSTNQPPPRYPFDSIALRPLPALPQATPTGGPAVGGFGQATGTGGFG AAPATGGFGATTGGFGAAPATGGFGKAPATGGFGAAPATGGFGAAPAGGGFGKA PATGGFGAAPATGGFGAAPATGGFGKAPATGGFGAAPNAAPATAGFGAAPAGGGF GKAPATGGFGNAAPFSLNK
Trypano-plasma borreli	Kineto-plastea	non-public	GFGAPAASGFGAPQQLQTTGHITAAQIAEAERKAGELGPGYCCRTKPHWSLNLDLT SLYDDAPFETLPQPLQQFLAEIHAFQKKQRKELTELNMLVSELESETPSCSSLSGIKK GYRAITTATPSTTNSNGNSRKSLAFLQKRLNQMTRGSGKSLESNLVECREWGTRTS RFSSHISALHSNLNRYEREVWESIRMRGADYWKSGRNHAEGPSKYFEEVVLRIGCQ MESIDASLREIEAAVMPTSNRGDVCGMHPNESEWSNVLNGAILPRELPNVTGFGNG VAMSNSPVVNAARFFGSMTTMGLQCTSQQPVSHPPHWSNPFDLNYLFGVPSQDIG PNSVRLLHNRDKSMPSETTHYVEDNRRRYYTNNNNPSYYINTSSMGPSIRGTQSRM SDGSQVGLFGVGGVASSQNGQRDVGSVYPGCVTVTQTDPQDPVPAMHNELAAIIQ LASRVASSHANANEVRELFAREYGATEAHRVLSLSSTGRTNTIIIADLLRGKQGTYYY DFEDRHRSSFNNQSIDGVAYEYSNLGSAVGGKSLTSLTTSSMPDNNLQFRDISNISIS NINNNKIMHYDPDIARKHAMKKVATGPTSTIPTTGFSAPVTTTTIVSAPTTISAVDVAK TVTSAPTFGATPAPICAPVPAPVPVSGGFGGIDFEQGAGHGKKRMDR
Bodo saltans	Kineto-plastea	GeneDB| BS64090	MFGKTPAPAGFGAPAAPAAGGFGKAPAAGGFGATAPPAGGFGAPAAGGFGKAPA AGGFGAPAPAAGGFGAPAPAAGGFGAPAAAGGFGKAPAAGGFGAPAPAAGGFGA PQAAAGGFGAPAAGGFGKAPVAGGFGAPAAGGFGAPAAGGFGAPAAGGFGKAPV GAPAQPQLVFTGITGPGYTAPNTPSWVTGTDLTQITDDTLVSKLPQNLQTHLGQLLE FGAKERHARTEIQHAYQQLQSESNKKGLRALQDRLDNLTTKPGSLGVDQLIVQAYH RDKAAKQLLQRAKDTEDDISNYSRDVWDRIHREGTEYWQQKLNIREGPSELLRNML ENTAQVMAQVDDVINTLAAALAPLQRHNGRRTAATTDGQRPGATPLAPPPTSRLLQ SQSSAVNLYGAGGAANGSSPNAPISNGNHQLFDFNVNPIASAPADPIELVQESLQQT MNAFLNLGDNVSGLHSRANQVRDHVVRYYGETEAEDVFSKKDSLGGGASDDDVAN DNEADEFVTITIGDTLKGRVRNNELIGGGYRVSKALGGGGSARSLIPGIPMTRHSMR YDPTLEQGVGNVAAVAGAAAPAAGGFYCFLV
Saccharo-myces cerevisiae	Fungi	tr|G2WDT3	MDISGFVSRAFTPKPSPKRRAVDLDNSAAQVSTRELERQRLEDLNHALSRYISRVRA LETQVVTLETHIESFASVKAPKNDEVLETLRAQLEQAKAELDDASQRYADLQLEHSN LQEDFKRAEGDIQGLTSLKERLQGRIESLQAMVNRLEGQLASAQSSLQEEKEDGDL ARQQLKDLKADLVKHRGRADSEAKARVALENEISGLQESFRLKELEHQSETDALQQ QLQVALSQVVVSVKTTGNQYEEEMSRLLRVAKSSYAEAADAFREKLKKYYQMNPTP SAAPSMMQDPELKRLQAENEALRNRVAARDQDVADLKNEARHAEDKIDRLTHDLAS TKAENKAHLANKDMEIKNLQQRISGLEDQYRVLLDRNLSLDAEIDQYRGLLGEEYKR LNMHDQSLDAMDQLVGSPLSAQRDEQAGEQDLDMSVELRHMTEEVEEAWTQRMS SNGQIQIQSVDLDRGFDLHLQNIGQEPINFDDCVLTVDNGRVSETLVMPHGHVVAVG QVVRVVSGLGEQSHRPGDIAWTSFRDFEFDNTINVQLERGSQVICRAEYTCEDSTG ATRCCMM
Schizo-saccharo-myces pombe	Fungi	sp|Q09793	MFGLNKTPSFGSTGTQNQNTGTSAGTGLFSSNTFGNNTQANTPASTGFGGVTGGA FGQTKPQTGGSLFGNKPNATSTTPGLNLFGQNPQAAPGGSLFGASTTKPQAPGGL FNQNQTQAQPAQAAPTGGLFGLSGQNQTQSQTQPAQANTSLFGQSNIGTTGGLFD QNRPNTSTFGQFSTQPASAGLFGQSTQPSGSTGFGLSNNTQTTPFFSAAQQQPST TQLPSNPAINATTRYSSLNANTQKFLDDLDKEIFSQIQLAEELQTKLGTVSELVESVPN DVAEVQRRLSSVSTALLIDSDEIETTKRVVDEDTSNARISSRILDVFKTPGATYPFASN DPLMNYFEQFTENAKKRTDLYAATIGELEQHLEQVETTPQNNSPEALLKTIKEEHKLF MALSNRFAQVHDEVKRLQVNTSTSLPFIS
Aspergillus flavus	Fungi	tr|B8N834	MFSGLGGQQTNTGGGGLFGNSTATTSQPQSGGLFSGTANANTAQSGTTGGGLFG GASTAQTQSKPLFGGMGTSNNTGGSLFGGANQNNTQQQQQAQKPTLSLFGNQNT TTQQPAQPTAAAGTVVPGVKVDLSNLLPTTKYESCADEIKKELEVFDNYVLTQIKMC NEVGNMIPSIAAQGETIPNDVEFVQGKLETMQHALENDASDIDQLRSLVARDAAEAQ VGFRAIDTLKLPLQFQPAAGSGWWSVQDQKLSDRQSLRSTRKNTLALPDDVEGDS STTVNGVPVNLVDYFSQRSDEMGTVLERYKQNLKEIEDHLHGVEATLERQIHEFVTS RSRDGAAAGTPKSVLNDLAVVLGDVEAGILGVASRLGGVTEQVQEVVLGPPSLGEG RLNL

Tuber melano-sporum	Fungi	tr|D5GCV8	MSLFGRINTPTSGTPSLFGGQQQQQPQTPLFGSTTTTSGSSGGPLGGASQPAAPA PGGLFGGGQAQAQTPAIGTGCGISGGAATPATSGGGGGGGGGLFGGALTPAATPA PASGGLFGTPSTTTPTTGVAPTGGLFGGATQAATSAQPAGGLFGAGTAASASAPAT GGGLFGGGTSQPPPKPLFTGPSAATTSGTGAFGSTATPRPGGLFGGTTPSTTQPQ QQSQQQQNTVPAATIDASKLIPTTRFGDCHAEVQRILEGIEQEIQEQIRIATELTAHFP GHRATIDSIPSDTAVLTHKLATTKSFLAADDAALSTARQHHNEDDAAATLSIRNVDLF RVLPAQRSQYIAQQHNQPMRENDITSNKPMINYFDTQIAKMDQKLDLFLESVQEVEL SLRSVEEQATMGSIGGENLTALTGGVGGRQDARRLNRTLREFNDALKDVSGRIVDS KDGIRALRSRR
Dactylellina haptotyla	Fungi	tr|S8AK90	MSLFNRVSNTPSAINTSAANTFGTASGAATGGIGGTAAAPSLFGQSTASQAPASAGL FGGAPAAAPSGGLFGATANTTATNAPTAGGLFGGAAQTAAPAAGGLFGAAPSITSA GAGTFGAAAATPSAPAAGGLFGAGQATAQAPAPSGFFGGGPAMQPGATQTGAAG GGLFGGSTAGGSGLFASQAQRPAGSMFGQPPAQPQPNMFGQSQAQAQPQAVEM NFSNMRGTTRYEELHADVRNLLDFLDDYIQKAIGISQELSARTVGHKETMESVDGDV EHVSRKLGFTTTFLNNDGHSIGQLHNASSQLINTAALSTRTIDILRLPISQRSQYLSSH HTSNPEYSLIPYFEEKAGELEGKTQNFLAAVDEVEKTLEAVERDVGQVNMSAESKVK EVVKAERVVFSGMLAVASKVASVNEDLKVLTR
Crypto-coccus neoformans	Fungi	tr|Q5KP67	MSFGGFKFGNSSTTAPATGSAPTTSSPFSFGNTSTSNAQPAAGASNTGGGMFGGF GQNQQQQPQQPAGGGSSLFGSFGAKPAAPAAGTTGTGGGLFGGASGQQQQPPS GGGGLFGSTTQPQQQAQQSGSGLFGSTTQPQQQQQQTGGLFGSTMQPAQQSSG LFGSTVQKPAGSGLFGSTTQPTQQSTGIGLFGSTAQTAQQPASTGLFGSTTQQQQP STSLFGQSTAQLGGSSLFGQTTQPPQNQQQELKTSANPGANTGADKTTKFSDLPEA AQKYIEQLDTAIKNQKSIASTLQTEPLGRAIWQTSLDVKSATEEYSSISHTLKSLKNSIS QLRDKMIDQSRDVERIKEIWDIYTSGEGRMGQIRLGAYKEFPHEFFSKVANSMEERV TRYKKTITQLNRVVASLSSDSQTSSPQVIAQTINNHQQAILALAAQLDQLQVRMNGLK AEFTADWRDKTGSVRDPFEMAREERNVKV
Wallemia sebi	Fungi	tr|I4Y9E0	MSLFGNTTSGGGGFNFGATAQPQQQQASGGFGFGGGSNTQASNTAAKPSLFGGA AAPTATQQPATTGFGGFGQQTQQPQQNQQQTQPQTGLFGSQQQSSTTGGTFGGF GQQQQQQQQPQPQQTNPLGASTNTPFGASTGFGTTSTLNQNTQNAQNTSQTAKL TRTTKFNDLPDAHRKIIEDIDAHIQGRSHIALALKAEPLGKDVDRSSVLLDQVSNDLMS LQGTLASTAASLDSLKNDTEQDTVRALTMTRIIDGYRRPQESGAWLKTYRDFPHEFF AQTAVDLKDRANKYTGTLEQIEKHLSYLLTANAAGHTPQSIAQILQTQHATFMSLASN VAELAAATTNLKDGYRDIWRSKTKSYADPFALSNVESNM
Puccinia graminis	Fungi	tr|E3L419	MFGASNPSASAAPSSGGLFGSAKPQNSGNIFGSSSTTSGGLFGASTTTSTPQTTGN LFGSSTSAATTPQTGLFGSTNQQATGQQTGSNLFGASSQNTTSTNLFGSNNNATG GGTGNLFGSTQGNSTPTGLFGSSNLQNAGQQSGSNLFGSSNQNTPSTNLFGSTNN NLNTSGVGNLFGGNQGNSAPLGNSFGTKASSVPVTPAPSVSQSNPVFTRTTRFNDL PEDAKKQLETLDAMIQTQCRHSDTLKAMQLGTEITEGTSLLRQVTSEMHATSASVKT SSNLLDSIRQSIDGDVADLLNLAAIVDAHHSQRMAVGSHNAAESLPNPMKFQFEFFS QKAADMEERVKRYRQTIDYVELQLKGLFDRPSPASIVPALKAQYSTFMVLADKVAQL DTAVRNLKEEYRDIWRHQTGSVRDPFAEIDQAFGLGSSTATFQAG
Homo sapiens	Metazoa	sp|Q9BVL2	MSTGFSFGSGTLGSTTVAAGGTSTGGVFSFGTGASSNPSVGLNFGNLGSTSTPATT SAPSSGFGTGLFGSKPATGFTLGGTNTGIATTITTGLTLGTPATTSAATTGFSLGFNK PAASATPFALPITSTSASGLTLSSALTSTPAASTGFTLNNLGGTTATTTTASTGLSLGG ALAGLGGSLFQSTNTGTSGLGQNALGLTLGTTAATSTAGNEGLGGIDFSSSSDKKS DKTGTRPEDSKALKDENLPPVICQDVENLQKFVKEQKQVQEEISRMSSKAMLKVQE DIKALKQLLSLAANGIQRNTLNIDKLKIETAQELKNAEIALRTQKTPPGLQHEYAAPAD YFRILVQQFEVQLQQYRQQIEELENHLATQANNSHITPQDLSMAMQKIYQTFVALAA QLQSIHENVKVLKEQYLGYRKMFLGDAVDVFETRRAEAKKWQNTPRVTTGPTPFST MPNAAAVAMAATLTQQQQPATGPQPSLGVSFGTPFGSGIGTGLQSSGLGSSNLGG FGTSSGFGCSTTGASTFGFGTTNKPSGSLSAGFGSSSTSGFNFSNPGITASAGLTF GVSNPASAGFGTGGQLLQLKKPPAGNKRGKR
Hymeno-lepis microstoma	Metazoa	NCBI| CDS28776	MALLASLSNILDSKQQKDTQVPPEILTVVEELKKYLAEQKKIRDEVAKTSNKQLDDLS TELQELQRSVTCNLSGLRRQNVKSSHLSEEILQLERNTGIIQRSLDMSSDFAQNSPEI NEYFKNCISSFSNRVQTYKQEVLAIENSLSSRAKSNLTPKELSDILRKLDDTFMSLAA QLYSLNEQLSVPKAHILRQYQSLDSGQIIESSTAASMSLFDEILFESEKKSANTPYGP SPFSSVTVTTGAQAATATSGLPSLGLVTQQPSTVTTSSSAFSLSALKPSSGASSFSL GGTTTASALSSTGFSLGGLGAKASTSTPSTAFSFGSNTLTASSGTTTTNSTGFGLST ASGQLSTGFGFGTSLTATPTTTASTGFGFGTGNTGTSIFGSPATKPSLFGSK
Hydra vulgaris	Metazoa	tr|T2M6T6	KTESERKVMATSSGFTFGATNNNSNIFGAKTTTSTFSFGTAPAFSGFGLSNTSNASS TLAFGATTNTNPGFSFGGFGAGLTSTSLPSSSTGSLFGSKPATTGFSLFDTKSTTAT SLPFQLGVATSAPSQLQSDSSFALAKPLENPKEEKVPAEFVTYINETENYLKTQRELK DEISRISSQTVNEIQDQLNTMNQAIAIISNSLQRDKLAAEYLKNQVGQELKNTETARLI RDLPLSNLHDFNAPMQYFQSLVLTFQIRIKKSRQEIEELEVFLSSSSPSNQFTPQDLK VVLKRLSESFLGLAAELQTVHEAVKMIKQKYLQFLRSTFNDYSDPFTSRRKKDLREK EPSDFNGPSPFPMIQGAGIISGAFKIDNKPQNLGYNLRNSSAFPKPSGTGLTRSLSFD EIAKSTPFSVSTEFGSSTNNNLPLGQSPATSSSSNSSFKLRNPPNGKRGKLY
Ciona intestinalis	Metazoa	tr|F6TX13	MAFKGFGTSNTGSGGGFSFGASSSTAATKTTQSSTGFSFGAPATASTGLGFGAKPT VSAPSLGANQSKPAATGFSLGGSATTKPTLGFGQTASTASTASALTLGSTQPQTTKP AFKGLGGVDLTSTASTSNGNGNKNNGISQAVKDQGVPEEICKDVKAFESYVQKQKS ESNEVGKFSVRSLQKINEEINSLSVAVGTISSAVQRNKAAVESIRNEFTNQLKNMEIA HRTQDTPAALQHENIAPIKYFIDLVSEFSISMQSYRHQMEELENHLHSLAQPSGMNP QDLSMALCKMQESFITLASNLHSIHDSVKHIKEQYLAYRKVVHGDHTDIFKQNIPVPA KSKKIEGPSAFSNLSNVAALAMASMLQQPQQQQQQQAPPQQGFLGQTKTTNTLFGG NASGSLFGSTKPTVTTGSLFGSKPTLSTTGFGGFGSTNTLKPALSAGLATSTSGNMF FGGSTTFSSSAGLLNSSTGKRNKK
Crassostrea gigas	Metazoa	tr|K1QL21	MFGGKPNPTPGFTFGATPSAGSTPATGGGFSFGTPSTQATGNVSFSAAVGQTPAA GPTSSFSGATPTASTGGFKLGGTTPSFPSTQSSTAAPTTGFALGTSTASTQSGGF KLGTTTLPPAFPGTTSTAPGTTATVAPAMGFAMPIPSSTATVGGGLGMGMGLGGAV KPTLTSTTSTLGGLFNTQTPAAKPAGILGATTATGSVFGTPATTSQTMGLGGVDPKT STTAAGGSAADPKAGDGKTLKKSQVPPEIVKTVEDFKTYIKEEKTVQEGISRMSCKP MYKVQEDVASLKQLLSIVSNGLQRNACAVEKLKKEMTQELKNAEMAQRTKDIPAGL QYENTAPTEYFQRLVENFETQMLSYRQQIETLEGHLHSISQPSILSPEELVELLRKLH ETFIALAAQLHQVHEAVKTQKEHYLNYRKIFLHDTKNIFEREKKAVKPKVLPEHFGPK LVELLRKLHETFIALAAQLHQVHEAVKIIYGFGSTAATTTTTSSGFTGLNTATVRPLGF GTPAAPTTTTTPSLFGTPQTVQTPAFGTPQGFPSAGGEQPFQLNKPPGRTKLGFEL GICGSEAKYMYFSH

Drosophila melano-gaster	Metazoa	sp|Q9VDV3	MFTPTTNNAIGGATAATGAFAFGARPATTTAPPPSFGAATSTPTFGAAPATTSLFAA PAATPAFGAPAATPAFGAPASTPGFGATSTAAPAFGTAAATPAFGIPAATSAFGAPA ATPAFGAAAATPAFGAPAATPAFGAPAATSAFGAPAATTAFGAPASTQASAFGAPA PAVGTVAPTFSFATPATSAPTTAPPAFGFGTTATTAAAAMPASLSSGIGSFSFPKPQ ATTAASLNFNTTTTTATAQPFNTGLKLGTTNATTTLGGGGIFSKPAGQAAAPAASTFV GLGGIDVTATQPKLGDNKQDGIKIKETQVPDEIIKTVDGLKAYIKQQKTISSDIGRTSTS KFTNVSHEITNLKWALQNMATLVEGSNQQIRLMRQETVKAIQSLEMAQRTQDTPAG LQFENNAPFQYFQCLVAKYEQDLIAFRQQIALTERHMHAISNPQSISPDDLKRGFRQL NESFISLAGRLHEVHQRVEEHKEHYLNLRRYRLRDTTNVFERIDNPPLPTVEPQRISS GPTPFSNISALMNKSYAAAASSASNATGN
Amphime-don queens-landica	Metazoa	tr|I1GF79	MAQQFNPKLSFNLQPQPGQQGLGLGTGRGLNLAGPSTGGGLNQGGGIGGARNGL TGTTAAPTGLTGLAPAPTGLTGANKPVLTIGQTGLTAPSSIQPGLAGLMSQPGQTGL AGLASSQSGLTGLTSQPGQTGLTGLAGSTSQPGQIGLAGLTSVQPGQTGLTIGKTG QMSLTGLTTTQPGQTGLTTTQPGQTGLTGLTTTQPGQIKLTTGLTAPQTGLKTGLGT IGQPSLGTSKTGLGTGLTSLTTTSGIGLTTTTSATGPRVTGLGGVNQDITQKSQVQSV SAGALPDEFGQLVSQFETFLANLKSTSDTISKSSETFEKKFRSVGDHIDTQQQQATV VSQELHQLNHSLSSLKDETHKEGRVLEIAQRTRELPTGLQHENTTPDEYFKETVDHF EKRMRMFRNQLEELESYLHAVSASSYSSQSLGPGDIISALNAQYRPFLVLAARLQVI HEEIQRLKEQYINLRRLMGLDSTDLFVATSNEQSKKSDKKSSESQVGPSPFAASIAQ ATAALTAMATAGQFGNSGIGIGTGGIGTSLGGIGPSLGGIGTNTGGIGTGIGGIRPGN AGIGLPGPTTGIGMGANRMGMGTSGLGMGTGLSSGIGTTGLGASGGIGMGLGNTG LRTGAGLGTGIGTGLGGGAGMGTGLSGIGTGGLGGMGTGLGGLGGGTGLSVAGTT KPFQLKPPPPGKRK
Helobdella robusta	Metazoa	tr|T1FRH9	MQQPLGLGFSGFGGGGSLLGGSAAPASSVPTGLGGFSGFGQASNASSNGFSLGG GGTSQPQQSTAFFGLPAATTSTTGALPDPVLGGGLALTMTTTSALTFGFNSLSAQSV AAATTTTNIFSNSSTQQFQGLGGTDFKPLSSGASAVTTDNSKISSGTVKSVKDHIILPT FISLVEDFNKNVRSQKSIRESISRSSQKSLLKIEEDVRDLRQQMNFVAASLQKISTCV DSLKKESTQELRNAEIAQRTNDLSQHMLQSDYKSPYEYFQNLLVKFEQEMDLCRTQ FSEVETYLESLNSNNLATPAELSCIFDKLNEGFLFLAAKLQVVHELVKAKKELFQSYK RNDIYSDRVDFFKAPSSKIINKNNATTDDINNINSTLNNALSSIIKSSISSNVSSSSGVN AVVSSGSGSVSGSSRAASLNPFPYINNMASTAMTSAVGSQQQQQQQPGSIGLFGQQ QQQQQQQLQQQNKMLKHNLFNSNRNQNNNADDSSSFVLGSNLNNDANLKIGCKR GKPLS
Arabidopsis thaliana	Plantae	sp|Q8RWH9	MSFFPPQQQQTPQPLFQTQQTSLFQPQQTNSIFSQSQPQQTNSIFSQSQPQQTNSI FSQPQQQQQTSLFQPQQFQQQQQQLNQQQQQQVQQQLYLFTNDKAPANYSTKW ADLHPDSQKLLLQIEEKILEHRSESQRLDQCSRLYDSSVSSEGFEFDASRIVQELGGI NTAMDRQKAVLHELMIVAKDMLRNAEIAVRSFMMLQPRFPHWKQGGGVVSVGSQP SQGQGTNPAPASSGQQQAVTTTVQVSDFYRGIPKKPTAFLLQTVVRFEKYLNECRQ WVEELEQLLALDSDKYSRHASLLESLPKVMSNVHDFFVHVAAKVESIHQYIESMRTS YLADQRRRGECHDPFLEADRRETAKQEAAAKRVHPTLHLPASTTSTQPSTQVAGLI ASSATPGGSNPPQTSVPTSNPSSGAGFSFLNTPASGPSSSLFATPSSTAPTSSLFGP SPTPTQTPLFGSSPASTFGSTQSLFGQTTPSLTMPSQFGGATPGSGASFGSMTKSS RPKSRTTRR
Oryza sativa	Plantae	tr|B8BCJ8	MAFSFASPAPQNPFQTPAQAPSLSPSPFQFNLQQPQQQQQQPPPQQQAAPAAQP QQQQQQQLMLYTTDGKPAGYNTKWEELHAESQKALLQIEDKLREYRDESERLDQC SRLHDSSISTVNFENDASEIAQELGGTTTMMEREKASVQELMTVVNEMMRNTEFAIR SYMMLRPRFIRPGAGANGGGSNPSGPAGAQSNQPVALAPTIDFYSGIPKRPSHFMQ QTINRFEKYLGECCKWIAELEQLVQMENNKRQSASLESLPKVMSNVHDYFIYVASKV ENLHQYVESLKTEYLHEQRRLGNANDPFLEANRREAAKQEAAARRVHPTLHLPAPV QPTTQIAGTVTSQPQQSLIPSGATSSSAFPSFSTPASAPSSSSLFSTPTTPTLSSNLF GTSGSAQLSTPFGTVSTPTLGSTPAPSGFGNTTPSFASTPALGGTSLFSTPFGGGAT ASGSSFGGTSKVRSKPRGRR
Amborella trichopoda	Plantae	tr|U5D5J3	MAFSFGNQSPLQQTTPLIQQNYAFPQQQQQQQVQQQMYLFTNEKAPASYQTTWS DLHPESQKLLLEIEERILEYRVESQRLDQCSRLYDTSVSNDAFELDACHIIQELGGIST AMEREKILLQELMSVVKGMMRNTEVAVWSFMMLHPRFVHTRGSTTTHSSTPPISGA MTHANPNTQQKATSVVPVIDYYSGIPRRPSPFLQHTVARFEKYLAECRQWIEELEQL LLRGSDENGNGNTDLTLLDSLPAVMSNVHDFFVHVAAKVETLHQHMESMRAAYLAD QRRRGEGNDPFLEADRRETAKQEVAARRVHPTLHLPSLPQPLTQVAGLFACSSTPS SSFPGASSSTPIMAGGTSSGFSLFNTPTSASTSTSNLSSSLFATPNLQATPFASSRLS QSSSLFGTPTTPSLFGSSSTPSLLGSAPSIATPAFGSLPFTSTPAIGPGTGLSFGATT AFEDEFVVKSCTDLLLQKLSSGLGLDPGKFEWYKAKEP
Physcomi-trella patens	Plantae	tr|A9SFH0	MAGMFQTPMFNQQPAQQMQAQQGGGTQIHLLTNDKMPVSYQTKWADISPESQQL LLTIEERVREYREESRRLEQREQNTDSSVLHKSFEYDAARILQELSAVGGAIERETAG VRENQADASLQLLRHAEMAVRSFLSLRPRFIAAQAQLYDFYSGMPARPSPFLQQTVI RFENQMAEYRQRIEEMERLLLVNTEKENSYGSQLSLLQSLPSVMTNVHDFFIHVAAE VEELHQHTGAMRTAFLQERHRRGDDSDPFVEAERRAIAQRDAAAKRIVHPTLHLPA PQTVTPTAPVGTTSTPGMFGGTQPGIFQIQSSTPVASQSLFGSTPTPSTNLFGSTTP STNLFGSTTPNLFSSTLTTTGGSSSSLFGSTLGSTTPQGEFECLTSLLY
Volvox carteri	Plantae	tr|D8U1A0	MAFSFGSTAPAATPFTGGLFGAPAASSASAFGTSTVPAFGAASAPAFGASSAPAFG ASSAPAFGASTAPAFGSATPFGAPAAGSTSPSLFGSTTTGFGTTNLFGQPASAPVTS TALVPAGGLFGAQPQQQAQQLQQPRPGLNYKTKFEELPPQIQQELQKIQQQISSYR DECKALDNDARLYDTVSIKQDLDSETAALRQTLQSLYQAVLAEDEGLLAFRERVMVL LRSTETAIRLYQRSKLWREISQVPGPGSGQQQLLLTQAVQDQMSQPVQLPNPYLGL AVRGFSAAIEQYHSCISELERVMQASAVGYGGTDEATAILNLPTLVSHMHNYFVHVA ARMERLHGEVARAREAYLAQQRARGDYSNPFAEARPLHHIPAGPGKLAAALGGSG AASSNFYSFGGPAGGGGMGPGGGGIMGPGGGGGGGGGGMFGGGGSTAPAPAP APMPSLGAPGGNTASGGGGLFGGLNPVAFGSSASPFDRYR
Chlorella variabilis	Plantae	tr|E1Z6R8	MFSFGAASTPAFGAASSAAAPAFGQAAPAFGAAPSPFGGGVATPAFGASSASLFGA TPAPSLFGGGPTSAFGFQSSAAGASPSLFGAAAPTVGAPSQQVTALTTKDNRPITHS SKWDDLSPQTQQYLTELEKVVVQYREDCRQLDNDPRLASGSGAKEQQEAMQAQA RSLSQAISALGSAVKADVEQVGALREAVLYLVRSTDTALHTFKRAHAWREASKASAP LASQDIAGPPVLPAQFLREAVAMFLDRLKQHQAAVAELEQVLLASGATGQMLRRAS GGNGSHPADGLAALQAALTNVHDFLIHTAARLQALDDRVAAAREAFLARRRAAGDS SDPFAEEERRQHKRSAHQPRSPAAQAAALQAAQQPHAAQQPPGTGYTTTTFGMSP APASHAASPGGLFGTLQPSPGGAFGTPLNFGDAQQQRSAPTSRKPSSRRR

Phyto-phthora parasitica	Strameno-piles	tr|V9EIM9	MAFSFGGTAAAPAASSGFSFGSTPAAPAASSGFSFGATSAAPAASSGFSFGGSSAA PAASSGFSFGATPAAPAASSGFSFGATPAAPAASSGFSFGAKPASTPSTGFSFGAS TAPASTAPSLFGTTGTATTTPAPTGFGFGGFGTQQPAATGGFGGFGTAQPAAATQP AGPPITLETAFEALPDDVKKNMTQFHAFLKEQDQSDAFLKTVSPRQMEVLRENMAK LEQEVLARRNRQDRQTAAVQHVRQDVRQLLHQVDAATLTRRSLDSSNGGTPNMYH VMRRVEMPSPYYWELLDHYEQKMAAIKAQIEDVEAQFKPLYDGRSNANATGAGAP APAQLQQILLAQNAALMQAAARVAEVHEKAEELRQLFLTKMREDLARHGEKNPAAF QNPFDKRKKSSEADKRQAIDKIRFRTSVAPTIVTPQPAAAPATGFGFGTTASTATTAP TSGFSFGSTAASAPAKTVSFNLTSTTATSVAPPATTTSITAAPLATGFTAPTVATSGF GSSFLPSATDTSAAVGSKRSGRAQKMRK
Albugo laibachii	Strameno-piles	tr|F0W7S3	MKTSRESMRLCSEAFNKNNSVSTFCLENTICIAMSFSFSSTPNSSGFQFGNPSNASS APSGSALTSKPFAFGSTWNANPATTTPTFASPFGFNTSTPSTGNTFYGTPTPQPPIT LETLFEDLPNDVKENIIAFQAFLKEQDQLEIFLQSISSENLVQLKKRLSDLTQMVQSRQ HILARQNTSAHHIGKDVKHTVLQVDEASLILRSNMDKQNGSTTLVAQIARNVHTPSPF YWKLYESFENRMSHLKQQIEELQLCIQSDEMIRCNSPNDSNIIQSNTGQIDSQSITND SFHDIFVQQNAALMKVASLVAIIHERNEKLRDRFLANMKQDYIKHGDAIAAETFKNPF EQSQKRNLAEQERRQMLDTIRFKTTVAPSLLNVSQPPAVNMIASTSNSFTNPSTTTP NVFGSVSAPTLNAPTKHVTFDFGTSAPAATTTPSFGFGTNPIGCTVPVTGAGSSSSS LFSSSLTDKKSKRSTRSKTRR
Saprolegnia diclina	Strameno-piles	tr|T0S2F3	MAFSFGASGASAAPATGGFSFGGASAAPASTGFSFGGSTPAATSAAPASTGGFSF GGSSGSSTTTTAAPASTGFSFGGNSTPAAAPAAASSTGFSFGGSSTPAAAPASTGF SFGGASATPAPASTGFSFGGSNTTPAPASTGFSFGGASSTPAAAPASTGFNFGSTA AAPSTSSFSFGSAPAATPSLGFGAAPGNTKAISLDTRFEDLPADVQKQLIEFGTFVKE QSREEASIRAVSSAKLTQLKESTTHLEQAALVLQNIHARQAKNIGALKTDVKDLVVQA ESADQTHLHMTSETGIQRHEPMPSPYYWSLVQHFESRLATLKGQMTDVHSQLQGA KHDDVSMDADEASTVHMTPRVLQETLQSQNEAFMRAAARVADVHERADTLRDQYL SRQQAAPHGFGLVRNPFEAADRVQAEEERRIVDRIRLSAAQSTLPASSSTAVATTAA APTATAASTLFSFGAATTPAPAAAPATGGFSFGAAAATPAAPSAFGTSSFGAAATGA VPSLTKSVSFSGLGTPQVTPDAGAFGANKSARRPKTKKR
Aphano-myces astaci	Strameno-piles	tr|W4FE99	MAFSFGGSTTGAASTTAPAFNFGSAAPAAATPSGFGFGTASNAAPAATTSGFGAPA TSTGSTPAWNLGGSSATPAATSTPSFSFGGATTTPAAAPTSSFGFGSTQPATGFAA PASNAFSFGGGTNTTAAAPSTGFGGFGTSSNTQTSLFGKPATSGGFGSFGAPSGF GVAAATPAQPPQPVVSLDMRFDALPPDVQTQIKDFDHFLKEQSREEASIRSVSAQPL ADLQDATKQLEQVALVVRNIQTRQAKDIQLLKSDVKNVVSQAEAADQIHIHLTSDTGI QRTDEMPSAYYWTLVQDFEQRMQTLKCQMNDVHTQLQGLQQTRHPHMQHPTPQL LQQILQSQNDAFMNIAAHVATTHEQAEVLRDQYLATLQHKQQPDGGKVRNPFEAAD RIQAEEERRIVDRIRLSAAQVTFPAATPGTTAPASSFSFNTPAAAPATAAPAPSTFGT TATGGTSFSFPAVSTAAAPTTSAFGGAQPPPTLTKSVSFAGLGNVAPSADSNASGA FGMPPVNSLNPKSVRRKPSSTKKR
Thalassio-sira pseudo-nana	Strameno-piles	tr|B8BZW1	MAFSFGAPTAAAPTLAASTSFSFGGATAAAPAFGAPSSAAPSTSLFGSTPAASTTAP STSLFGGTPAPASGGGGLFGSNPVLFAFNSIQAPAPSTSLFGSTPAPSTGGLFGSTP AAPSTTSLFGAPSSAVNSGGLFGSTQSAAPAFGTAQPQQQQQFQQQQQQHATPLS ANTPYSQLPDSAKKTIDSIYQLMMQHRRTLASVKTMAPSLLRIEGQENIHSASDSND NIPPSSPADAAAGFAKRSSSSKSKEPIDPSNMSLPQQMINLHTQINTLLRSAESNMAE AQQLKSRAGNAACVAKMHGAWPVESVAARRGVALSSVRAVLGDRKDASSGRSDG TSALGGGNGGTASSSTSSGGTPASSLNVSGMNNVDAVALQHMMDVRAASVDRME TMPSPYLWEVLHNFEERVAIVQRDVDAVKARLTIAEEAERVQALGGSGMPLGDETA LLLSNNCFAAMASLMMYEGGGIGRQVPLCKQLASLARSQNEQFLRIAAQAARVHEG LEEVKMRYRRFCENNMTYGGGHYEDPFLRADVEEIRRERELQQRIIEEQLATVSPVK TSFSTTTTTSTAPATSSLFGTPSAAPSSGGLFGNNPAPAPSTGLFGAPGVFGAPSPA PSTSLFGAAPTPAPSTSLFGSTPAPAPSTGGLFGSTPAAAPAATGGLFGNPSPAPAT EGLFATPTTPAPTLAPRKKPGSRSGGRRR
Thalassio-sira oceanica	Strameno-piles	tr|K0TB43	MFLQKPYITNNLTRVQPRQLEEAFSALLAMRRAFSGAQRLVRNKKILRTQNNDIPHM NKYCSYHLRPAPSAFGAAPGTYKNAEFSWSLSESLTLLQPAAPAFGSAPQQAQQSP VFSGNTPYSQLPDNAKRAIDQIYQLMMQHRRTLASVKTMAPALLADQSSTCDSMNE KVSPADAAAGSPKRTTPQTDETLSQQMVGLNSQIQTLLQSAESNMTEAHQLKSRAG EATAQAKLHGAWPVENVAARRGVALSSIREALNDPSGEPSAGSNSNGKPASSVNV SGMTNLDAIALQQIMDIRASHVDRVEAMPSPYYYEVLHNFEQRVIAVQRDVDAVRSR LAIAEEAERVQAAISGGRMMGNDASLLLSGGNANTMMMLYQNNGHQVPLPQKLAS LARSHSDAFIQISAQAARAHEGLAEVKLRYQRLCQQRQGYYDDPFLKADVEEISRER EMQHRIREEQIATAPPPEPKPAQAAPSTGLFGAKSPAPATGGGLFGAPAPSGGGLF GSTPTSKSLFSSSCQIPLHLSQLLTCVPDEGGGLFGSTTSAPAGGGLFGSTTPAPAA APAAGGGLFGSKAPGNNTSMRVFVIPLHVYLTFQFLAAPAAGGGLFGSTTPGNHSW TCCCPVARLFLRFSIPAAPAAGGGLFGSTTPAAPAAGGGLFGSTTPGTSKDSSASA MHASPSDIVFLAAPAAGFGGKTSITHII
Capsaspora owczarzaki	Filasterea	tr|E9BYV3	MQGYGYGQQQQQPGMGGMNAGLGAGMGRGLGMGAAAPGQPGMLGMGGQQM GGQMGGQQLNPMGQQQMGQMGHQMGQMGQMGQMGPQQQMGQQQMGQMG QMGQAGQMGMGAGAMATPAQQQQQQQQMGGYATPQQAATGYPQQGAMNAGA VGQQLFQTPQHQAVAGAGMMGATPGALPGAMPGAMPGAMGLGAPKIGMGAAGM GAAGLPGAIGATPGAAPGLGMGAGLGMGAAAGLGAARPAGLGGIGGAAPGAAAAA GGLGAVPAMGAMGAMGALGAARPPGALGAGLGAAPGAAAAPGALGGLAAGGLGA ARPPAALGALGAARPPGALGVPGAAAAAVPGAAAALPGAVPGAAAVPTALGAPAAA AGGLAGGLGVRPTGLPAVGGLAGAAPAGLAGAAPGLAGAAPGLGGALGAPRPLGA PGAALGAPGALGAPGVGLAGARPPGALGAVPGALGAPGAAGLGARPIGGVPGAPQ SFGISLSSAPTVTMNTKFSELPEDWKRKLLDLEKSIATQKSASNEIANHTNARALNVA ARCKTLKQKAAVLATTIERDTVVIDRLKRDVVQELKNAEMASRTLARLKMPIPASMQL EMASASDYFNHLVTNFENRMQNYRQHIEELEAHLSSISEREQMTPQALSDIMRNQH ETFLALAAQVAQLHDAVQEQKELFLSHSAGDPFAARKKAKEAQVKRPIPASGGLTLE SSLRYYNTPAQAPRPAGIGAPGMGGLGVRPPGALGAPALGGLGAAGGLGAYRPPG QLGAVGGLGGAGALGGAGALGAAGALGGLGAPRPALGGLGQPGALGQPGALGQP GALGQPGALGQPGLLGAQPAAGGLGGMGAMAPQVGAGVPPLNVAATGSDLLARR MQNKV
Naegleria gruberi	Hetero-lobosea	tr|D2V106	MSGFTFNFGGGGGATTQPASTTTATTTGGTTGGGGGFSFGANTTQPATTTTGGTT GGFNFGGTTNPTTTGTTATTTTGGTGGFSFGTPSTTGGTTTTQPTTGAGFNFGGTT TAPTTTGATGTTTNTTTTAPTTGFNFGGSTAPTTNTTNLTTTNNNTTTNATVTPQQPI TPKTQFQKLPDQMKKQWEQFEKEKTETKRNAMDIVKQQENSSDLNKLKRQIERVEK KINTSKVNITRAKDNVERIKHDVLVESKNAEQAQNNFNKLRSAYTNTDPNYSSTYFIN TAQKLEQRMQEIWKQIEDVAQTLSHSEAYQLPFGQLLQGTIVSQQQAFFNAAARLSV LHEKANELRDEYIRTYQIRGDPFKEPSKTSKPSYNYSKLSNSSSLPGLNIPTTQPTTS TTTQPTTNTSGFNLGTTNTGFGLTNTATTGTTTTGFAFGTPTTNTANTGTGFNFSTQ AGSSSNKRRM

Acantha-moeba castellanii	Amoebozoa	tr|L8GM16	MRSDEIAQHSFDALPKVKSEVEVATERLNALYNTLQGDMETVAEIRSNITKELKNAEV AVRYTERLAANVPLISQQNLVLPPQYFRELLGTFEKRMEQYRHVLHEILQLRENEPK TYTPQMLQDILRHQYEAFMAAAARVADLHEATEASKEQYVALRNQATGGNETVEDL FEKEEKRRQRQKAKLMPLATPAASAPAPAGASTPAGAATPSAGGGLWPSTGATPT SGTGAAASTPFSFNMGSAFTPATTPSTPAAATTTSFPSFGAAATTPTASTPASLTSS LFGSSQTSSAGGLGFSTAGTALSFPTTPTATRPSSSGGGRPTTGRKGKGK
Reticulo-myxa filosa	Rhizaria	tr|X6NSJ8	MSFDWDNSSKKKNENKDSNFVRLTDHLKSLSEEKQKPFMQFELQQNKKNLKYQAF FNIVCIQTTKRTKNDRRNVIKVNNEQQEQVKQVTEVLQQFPDMSSVLKAYSEETEML MDKLERYKHDLEPLFERLRIEFSHVHQAQVERLNRKMSGNTMSSFRPALPPTYYVD QIKYFETKIEECRNGLKDIQQHLRDYDDKDFANRQLQSLSPEVLVHTLQSTHRATEYI AGQVVLVHKQVEDLKNAYRKFRTDRYGDTTDPFSQTSKSQDYRRESIKTLELSLGLQ HFEPQPVSWGKKQEETSQPSNEKKKDSWSFDNNTNKDTSQENWNFDSSKSSQG WGGNTSSSGGWMEVEQVGE
Trichomo-nas vaginalis	Parabasa-lids	tr|A2EXQ3	MFGKTSLSLGKKAVYGPTVEEGMLIQDLEVEARNILIDTYNNAVNLFAKEKPIDGLDS FGKKITDLYDDVNRSINHTLLHLANEIDHGNSMIKEARDELDTFHRDYTDSLHSQTFP SPFISRFTDNLQQRSKNLSEAITSYETKLQNNEQAESPAVLVQVLQEQYNAIIRCSAR VSEIQRKSQSLHETFKRIFQNKDRKISDLRLDSEENGKQSVVNSVQTAYDEYLEERR RLLEKRDTTTDFSTICAPDTKAGGLFGKSKFSFGSGNSSLNKGTSALSKPAGT
Trichomo-nas vaginalis	Parabasa-lids	tr|A2FLI5	MQFGGMGKAIPWEDIKPIPEDTVITENEKFLKNTQFLGFVTQLLEIQSDFTKTVKPLE GVESFNKVMNEIEINATRALQHTLTTLSNEVNFGKSVIDDSREKLDEFRRSQRGIQSN SNQTFPSAFFTKYVEDIDKKAEEITDAIKLYERSLEPPKYSTNPTTLIQMIEFQHDAIIR CASKMADIKDKTNKLLERVSDRYKNNGLKTDILDSKEAETEKMSDAIHIEAAYKQYLN KRKADLEKRDKKTNFEELCKGTATNTFGSGLGGGLGKGIGGGTTSTSTSTGTTSLSL KK
Cryptospo-ridium parvum	Alveolata	tr|Q5CRQ4	MFFSQTNVGNVSTAGLGLFGSTGPGAASNSLNLSASITQTGQSITPPAIPGNSLFQL SNSQSGISNSSNLFGTSNLNNSSIGILGSTGSNVSLFGASQTQNQPQTQINPQAQYL PLNPTIGQLTNYIQSWKAEFDEIENQLRGNDKHIEYLTNNKLIEITRLCSTYKKGVERR NEEIENIKSLQFRAQDSIESVISEITTVQQLSHDITHIYDRIKDIDQNNSSRQIQPLRFPL PIFEFFCENMAKKCKGIEEIIGNLDRAVSSLREELTNATAEDVLKYIAEIINNNYEAFYD LVTKCSQLHDKTESVVNISKLHDASRN
Cryptospo-ridium hominis	Alveolata	NCBI| XP_668308	MFFSQTNGGNVSTAGLGLFGSTVPGAGSNSLNLSANITQTGQSITPPAIPGNSLFQL SNSQSGISNSSNLFGTSNLNNSSIGILGSTGSNVSLFGPSQTQNQPQTQINPQAQYL PLNPTIGQLTNYIQSWKAEFDEIENQLRGNDKHIEYLTNNKLIEITRLCSTYKKGVERR NEEIENIKSLQFRAQDSIESVISEITTVQQLSHDITHIYDRIKDIDQNNSSRQIQPLRFPL PIFEFFCENMAKKCKGIEEIISNLDRAVSSLREELTNATAEDVLKYIAEIINNNYEAFYD LVTKCSQLHDKTESVVNISKLHDASRN
Cryptospo-ridium muris	Alveolata	NCBI| XP_002139274	MLFGQNQPLQSSGNAPSSGLNLFGSNVNSTNSNLTNQNNSLFSTTGQVQPSSSNN NTMWGSGSSSYGTTTNQPNLFGNTGTNSNTSGLGNMGILGNSGVSTTNFGGLGLT GSLTGNLGGIGSSGTLSNTNIMGGMGGIGGIGGIGGIGGIGGIGTVGLRTNNGNS GILGNLNNATRTDGLVGLTGNSTNNTNSNLFGTSLTSQTNCPPGGAHYLPLNPTVG QLTNYIQSWKVDFENIEKQLRENDKHIEYLTNGKLIEITRLCTTYKQGVERRSDEIENI KARQDRIVDSIEDIIPNISTLQQLSYDLIQIYDRIKDIDSQQASQQIQPLRLPLPIFEFFCQ NMSKKCQYIEETIRRLENTVSSLRNEINNMNGSETKRNIIQIINNHFEIFTNLLTQCSAL HDKSESFVSISKLHETSRS
Aphano-myces invadans	Oomycota	NCBI| ETW04496	MASKRESFSPMKSKRLDEKTTLQELNNRLEMYVLRVKEVQDSRDVAEKELETIRER MQMDLSMTKTRLSKELEDTRKLLEFEIDQKTRLQVLEQEQHTELVKLRTQVKEFGDI RVELEQVQAELAKEKESSKAAKEALALQTTSLQSARRKLKDLDKENRKLTSSLSDTT NELDQLKQKTSEFSLTRDTEITLVRKEMNAKHLEALAAWRRESEERLHSVEAEVRAH FEGQIEQLRSQVDEVNLELDSLKVEYERTANDYDESLKIRQSLTDKLSTIETQYRNER KKFQEDRKMYEANIDNARQARLAKETEFNDLMDIKIALDAEISAYRSILDREESRVGID QANHSKKRKASLTPVKSSTTRQHKRRKSHSTGVLRITYLNLEQGRITLENTGSDALS LSGWQVSSKATNVVFAFPEDYVIQPNGRVSVISGRNAAPTEEEKESMDFYVIKKAM WNTQADVAQLTNPSGDVVSSYAEGMYVDDDDVDAADTPAKDGCGIM
TbNup53a / ScNsp1 / HsNup62:			
Trypano-soma brucei	Kineto-plastea	NCBI| XP_829614	MKGFAVRGRAPSGGGFGQPAVDTNATAAAPVLGFGSFGQSNTESVAGVTNPFGQ TANQSGGSAPAAGMGGFGSGPSTGGFAVGAQSTSSATQPAPVLGQTVLGFGATP GKGEGGNSVVPTGVGAAAAPSTSAAPTSGFSGFGSGAKTTLNPFGAGFGQTSTTG TTATAPSTGGFGAATSAVGQTPASGATPANTTFDGSASNPGNTGTNPTAGTATAVP AATTMVTNPPSGDTVKAGAPAAFGGFGATPPASGSNPSAAPTPFAGFGAGATAPT NPASTNATAGAATTGGGPFSSITKPSETGGNAPPATAGAGGAGLGPSLGAGVTGG NQSAGATGTVGAGDPTAISGKQASLELRGKMLSTILAQFDKAFSKDYRDFSELSQLM MLRDRQIIERGNEILSHSSHLEEAIANADVTRQTLIELKNKQAAIGTMLQRFEDAVQPI FAQVRPTFNSVDEAREETYTAVINLFDEVETLKLRLQQCVRQHNGSVRHLRQSDDL AKFVGLIDCQLSAMEVCAAQASELEREVDLLLGKSTIA
Trypano-soma congolense	Kineto-plastea	NCBI| CCC96052	MNSFTTAGGAPFGAGFGQASATAPAATGVPAFGFGGFVQPAANAATASAPSAVQP AGQTGAPACGFGNNSTAGGLGFGTNTQPASASGQPLGSFGVAGTATTPGVPATGF GGFGATTPAAPVPQGAPAAASFGTAPMTAIQNTAATAAPTSFGGTSFQQSSPGTAA PTPSSVPSAFPGSGGAPNMFGGTGPAAAAAATAASITGAASTPSAGLGSTAAGVVT GSSVTNPFAAVAKPAVAGPDGAAPSSAAPPTTGGFGGGALFGGATAPPAEDSNKT NATCLTQKHASTELQGKMLSAILAEFDKNFSKDYNDFLELSQLMMVRDRQIVERGNE ILTHSSQLDDAIASAEATKKMLTGLKDKQVAIGAMLQRFEGAVETAFAQARPMFSNV DEAREKMYGAVINLFDEVETLKLRVQQSVKQHNISIRQLRESDDIAKFFGLIDCQLNA MEVCATQAAELEKEIDLLLGRQTSV
Trypano-soma cruzi	Kineto-plastea	NCBI| XP_810212	MNGFGAPGGSVAGNNNFGGTFAQQSGFGGNTGGFGMNTAAAGAGFGSMQNSAG PIIQGHQGSGEQGRFGDGAFGGSTFAGGGFGFGSATTTSAPAAGGFGSAAHTSAP AAGGFGSAAHTSTPAVGGFGSATHTSTPAAGGFGSAAHTSAPAAGGFGSATHTST PAAGGFGSATHTSTPAVGGFGSATHTSAPAVGGFGSATHTSTPAAGGFGSATHTS APAVGGFGSATHTSTPAVGGFGSATTTSAPAAGGFGSAAHTSAPAAGGFGSATTTS APAAGGFGSATHTSAPAAGGFGSATTTSAPAVGGFGSAAHTSAPAAGGFGSATTT SAPAAGGFGSAAHTSAPAVGGFGSATTTSAPAVGGFGSATHTSTPAVGGFGSATH TSTPAAGGFGSAAHTSAPAAGGFGSAAHTSTPAVGGFGSATTTSAPAAGGFGSATT TSAPAVGGFGSAAHTSAPAAGGFGSATTTSAPAAGGFGSAAHTSTPAVGGFGSAA HTSAPAVGGFGSATTTSAPAVGGFGSATHTSTPAAGGFGSATHTSTPAVGGFGSAT TTSAPAAGGFGSAAHTSTPAVGGFGSATTTSAPAAGGFGSATTTSAPAAGGFGSAT TTSTPAAGGFGSATNTSAPAAGGFGSATTTSAPAAGGFGSATTTSAPAAGGFGSAT

			TTSAPAAGGFGSATTTSAPAAGGFGSATTTSAPAVGGNLGNSAAAATSGTAMGTC KSAAAELKGKALFSILAQFDKDFAKDYREFQKLSQHMLFRDRQIIDRGNEILAYISHLD AAISSAEASKQRLSELKSKQGAIAAMMQRVEDAVQPIYAKVRPNFTKLDEQREATYT AVINLFDEVEAFRLRLSQSVAQHNRSLRQLRECDDLERMAGLVDCQLSALERCSKR AEELESEMDLLLGKNSAM
Trypano-soma vivax	Kineto-plastea	NCBI| CCC54154	MLEPPMETQSTLYHPVNFVMTLASVAYFLLTVQQVDVVPPAVFFSFQRPLLSLLPIHS PQAYGVHFARAQCVYNGRVLFPPFFASLVPCSPVAGFGAVGAVSPAATGFGATTTP GATGFGATTTPAATGFGATTTPAATGFGATTTPGATGFGATATPATTGFGATATPG TTGFGGSVPDATTGVTNMSADATARKELSGKMLSSILANFDKNFSRDYHDFIELSQL MMLRDRQIIDRGNEILSHSSHLDSAISFAEASQQSLAQLKAKQNSISEMMQRLEDAV EPIYARVRPSFSKVDELREEAYASVLSLFDETEALKLRLQECVQQHNRSLQQLHECD DISKFVGLIDSQLSAMEVCVGQAAELEEELHQLLGKPDNV
Leishmania braziliensis	Kineto-plastea	NCBI| XP_001567611	MAFNAFASSATLGFGGGSTPAGGFGFGNLGSVASTAPPGAGGFSATATSVPALGF NFSAGASTSAASAPAPTGTTIGLGGFGAGNAASPSGPSASGFSTALQPPANPATPF GTSGFGSEAAASAAAPGTAAPAASTPFATASTLAAPISGGGGFGGTTTSAAAAPFS GFSTTTSTTLAAPVDATPATAPASALPASGAFGFAVAPAASAPTAKAPVGFGPFGGA TSAATPSADGAKTSSSGGFGLSTGIGAALNAASTLGDGSTSGLAAAPASFGGKSLSL APAPAAAPATGGFGVTLANPTSAGAGAAAAATLPAAGCGFNFGNTGAETASSDAAK TVGATASSAATASPPAAATGGSTVFTAAGATSSETRAEKAPLLSTAAAAAASPSQEF GGKGLGAVLRKLDIDVALDQRNFADLARHVVARDRQIMARGRELTEVQSVVKDALT AAKSAEATLAECKQRQAVLSEYLQSLEDKVQPYYAQWEQQQQHHSTDPRGVDQQ RAVTYDNVIALLEEVQGVEEKVGRAIRQHNHSRNELLGLSEIEGTMRLIDGQLCALQ CCSALASALELELDRLLGKAA
Phytomo-nas sp. isolate EM1	Kineto-plastea	NCBI| CAVQ010001283	MINFGAPASGGNVPSAPTAPSFGGAPANPPPAGTGVNPTNAPPITSWGAGFATTPL PASVPAATATAASPFGGVSGLATASPAAGGTTASATNAPFGSIPPAPAPTPTPPSTA GGKGGFCFTADPAKPAGPSNPAPGGFGFGQAAPPASTSTAPSPSPATAAPMGSGT PFAAPIAAATISFGALPSTGAAPASTAAPASTAAPASTAASTLFPTGAAPTSTEGSAP PLANGATSSTTPAISFGAPPSTGAAPTSAAAPTPSPLPGSPNEGKPDATDFTGKPLS KILGAFDKHFYHAQKDFTELAKHVVLRDRHLLERKLDLLSISHTIKGALSAVHATKSTL RECGEKQKAMDRLLQTMEEAVEPAFQRVEAASVLSPTGEGSSSASGVLQSADITRY LAFQHAIAVYDEMMGLQSKLEGAVGRHRQDFEETRGQGEVSRVMGLVAGQLSALD SCSELAAALETELEKLLGSS
Crithidia fasciculata	Kineto-plastea	NCBI| AODS01003144	TAPAPADGAKAPAAAPVASASSPGASPSQEFAGKTLSSVLAKLDTYVAADQRHFAE LAQHVVARDRQIMTRGRELMEVQSIVKDAVTAAKSAEATLKECKQRQAALSDYLQA LEEKVQPRYREWEEQQQQQQQQQSHDTRGMDQQRVIAYDSVMTLLEEVQSVEDK VSRAVRQHNHARTELLARSEVEGTMRMIDGQLLALQCCSTLATALEVELDRLLGKSE
Herpeto-monas muscarum	Kineto-plastea	NCBI| AUXJ01006122	TAAAAPAAGGFGFGKAPAAPGAAAPAAGGFGAAPAAAAPAAAAPAAGGFGFGKAP AAAASTSAAAAPATAAAAAGGFGSGAASTSATPAPGAAAAAASAAALPSSAQEFAG KTLAAIIGKLDKTYAEDKHAFTDVVRLVQARDRGIAEKTAELAAASYTIKDAVAAARAT AAALDDCHDKQQSITKTLEDLEALVNPVYSRAIAEAAGRAEGGTTTTAAAAAALPAA DRTRIAAFDAAVALFDEVQALQQRLDAAVRQHRHARRGMRAADGSGGEGHRSFGE LGGMIALSVSQLSALETCGAMAESLERSLDSLLGRP
Trypano-plasma borreli	Kineto-plastea	non-public	ATTPGFGSAATDQVTSSKGVTPQEVQEAMAELKGKTLGKILQEWDREFTDDYQNFH SAAIRVKGRDREIVDYGNAILSMTAQLDAAIESATATKNHFSEIVAVNLNNLAVDVQKL TQSVEAEKSNISNTKDQYIDETNADKGDGGRARYDEQREMTYRDVVRLFDETQSLA HSLDQLVEQHNVNATARNEDCDRIVRVLDYQLTAVHDLYRKVADLEDIISTTYGL
Bodo saltans	Kineto-plastea	GeneDB| scaffold458	CRIRRSSRSSSSCNSTTAAPAAGFGASPAAAAPGSTGLAAPAADTKPTTHAAARAAL AALPTAAALLQEIQGHTLSKVLQDWDKRFTAEFHSFTETARSVSKKDDTVLQYGNRI LSLKDALTYSIQFSKHTQQTWKDVAAQQHAMSLALKELEETVDPLFAKAQRDFEKTD ETRYDQYLNVIALTDEVNALAMRAQRQVRRHNESALESRCSDVDRVLGVVDSQLSV LEVITKRAHQLDDELTLLLGRSYY
Saccharo-myces cerevisiae	Fungi	tr|E7Q5J4	MRKRMAMPLNLPSHFGAKSDEKKDSXSSKPAFSFGAKPDEKKNDEXSKPAFSFGA KANEKKESDESKSAFSFGSXPTGKEEGDGTKAAISFGAKPEEQKSXDTSKPAFTFG AQKDNEKKTEESSTGKSTADVKSSDSLKLNSKPVELKPVSLDNKTLDDLVTKWTNQ LTESASHFEQYTKKINSWDQVLVKGGEQISQLYSDAVMAEHSQNKIDQSLQYIERQQ DELENFLDNFETKTEALLSDVVSTSSGAAANNNDQKRXQAYKTAQTLDENLNSLSS NLSSLIVEINNVSNTFNKTTNIDINNEDENIQLIKILNSHFDALRSLDDNSTSLEKQINSIK K
Schizo-saccharo-myces pombe	Fungi	sp|Q10168	MSFNPGNNQNSGFSFGKPAQPNSAAQGAATPAATGLFGNTNNNTSSTAPSGGLFG SNNASNTSAPSTFSFGKAATTGNSTNASTSSPFSFGSTNTNNTAGAKPLFGGLGST GSANSTGDKSKNTASSATGAATTNPSGSTFNFGSSNNSFNFGKPASTTNTTTPAAA STGSLFGKPAATGTTSNAPPASSTSTTPATGSGGFSFGKPASLGSTNNASTSTTAN SGFSFGKPATTSAPGSNTTVTPSSSITGTNDSKPAASNTGSAPTTGFSFGKPAGQA ASTATDKGTTTTSSAGTGFSFGKPATTEDTNKPTAPNSAFTKPATSTGDNKPTFSFG NTSKPTENTSTTATSAPPLSNNTKPAEGANQTSSGFSFGKPATDTTTSTSKTGPLFG NKPADPSAKPGATASTTPSEPPPSSIKHKTLQEILNKWSTDLTTQTEVFNKLCDQVS DWDRTLVDNGALISKLYTETVEAEQMSNRIDDGLEYVSSSQQELFKLLDSYETQLET FDGRATSALNVERERAFGVADDILSRLDRLGEDLGTVINQMNDFSKPDDSISEIVKVL NAQLASLGWVENRIFQMEEKLDTIKKKNSDVLF
Aspergillus flavus	Fungi	tr|B8NLM8	MFGTSSATGGQGSTLFGGATGSAATPSSGTTAFSFGTQSKPAGTTQAPSLFGSGS QTPKTNETPSSGQTPAGGLFGNAAKPAGGLFANATSTPGQSGGSIFGNTASTTPAG PPPQGGATGQPQSLFGQTAQKPGGLFGNVNTTSSSSTTPTTATAPSTNPLFGGAP QTQTQSNGGGGLFGSNTQNTQQKPLFGSTPAAPAGGNLFGNANKPAESTTPTTSA DTAPKPLFGAAPTPSTGGTTSAQTPSLFQKPAAGTDSAPKPAFSLGTTNTSAQPSTT PAASSATPQKSLFPAIGGTTSSTTPSTTPAAAPSGGMFSALGAAKPTGTTAPSTTAT APPATQPAAPTGGLFGNKPAGTTASSQPSTTSATPAAATDASKPSLTTPSAPATSTA TGTTGATATSNAATGGAALGASTAGPTPPAQSRLKNKTMDEIITRWATDLTKYQKDF KEQAEKVAEWDRMLVENGTKVQKLYGSTVDAERATQEVERQLASVEGQQEELGS WLDRYEREVDEMMSKQVGPGESLQGPDQERERTYKLAEKLSERLDEMGKDLTSMI EEVNGASATLSKTNKADEPISQIVRILNSHLSQLQVIDQGTSELQTKVSAAQKAGQSL SSRFGYGFSSSGMANSTAADDFYRSYMGRR

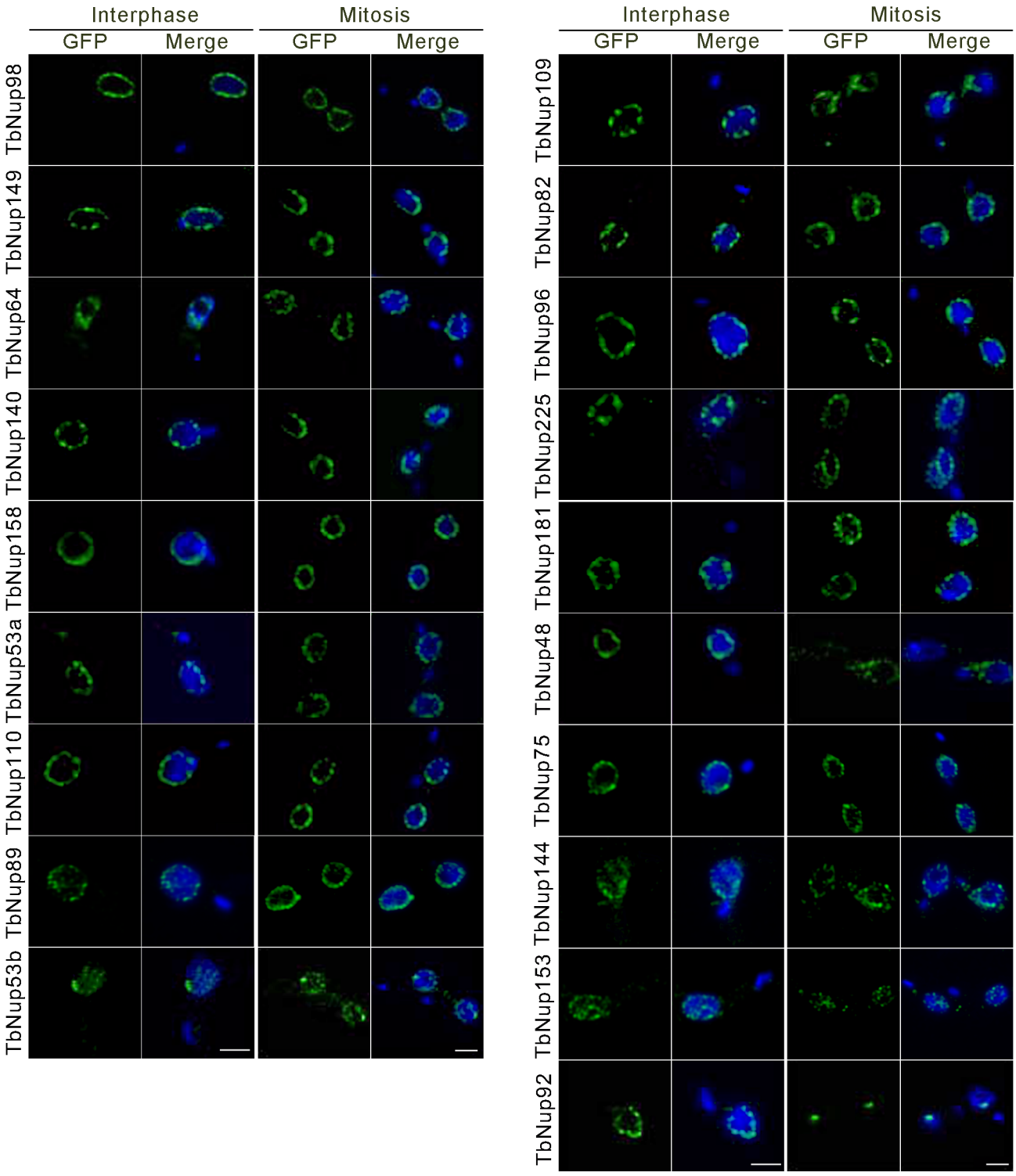
Tuber melano-sporum	Fungi	tr|D5GKM5	MSNPPVSGTGSSGLLGSTNTSGSSSFSAPSTNTSVNSGTSFSFGIAASGATSGPPS GGLPFGGAASGASTPKPTFGGSNPNPSGGPLFSAQSATPTSAPAPGGLFGNKPSG GGLFGVTQTPSGGPFSGGASTTPAGPPPGSAPKNLFGGGNPGIFGGGQNASQPSG SSGGLFGGQSQQASQASKPLFGTSATAAAAPLSGGLFGSTPAAAASSGGMFDGAQ AQQAASSSASAAGGPAEQKPGGPFGGGAGPSTTPASKPPTSGFFVPPSSSATPTA PAGTAPQASMFGAPASTPTAPAAFGATPAKDGASQSSAPNLFGNLASGTAPSASSA PANPSSSSGTGVPPFFGATAASTGTSTPPLFGSASKPPGAPASSAPPTPGGLFGKP PATSGPATSTATTSASAAPNSAPSGLFGGTTAATSAAQSPTPGVTAGAASGPSSQA NAPGASIPGATMLPPPQSRLKNKSMEEIINRWTSDLEKYKAEFVQQADDIKKWDSILI ENGEKITNLFSETLEAEKTQGRMDTVLQQLESDQEELGTALDYYEAQIKDLFEAQMG GVEGMQPADQEREKAYHLAEKLNDQLAGMGNELGGMIKEINKASTTINKTTNADDP LSQIVKILNDHLSSLQWIDSHTNSMAEKINEAQKKARDGAGGALGGDEDYFPSSSYR SMR
Dactylellina haptotyla	Fungi	tr|S8AEG1	MSGNQGSGGGLFSGASGGSIFGSSTTGTSGGGFFGNTPTAGSKTGNMFGSSETPS QGAPSGTLFGSTTPAAPGSSGSIFGKSTGSMFGASTNTPGASTPTGSSAAPSLFGG ASAPGPKSTATSNFSFGSTQAATPAGSATPTQSGMTASNLFGSTTPAPNKSLFAGT GSGNMFGASTTPAAPPPASLSSGSIFGASTGAAPSDANKPSTSAGLFGTTSSSNLF GASTTSRPNLTPSSTTSGLFSAGSTGAATPGGSSLFGSQPTGTADASKPASTPSLF GAASTGAGPMFGGAKSSTPAPSGTATPSGSNLFGSGSTTGGFFGSQANATSGTVT PSAIFGARPTDTKPPVSALFGSDASKLAAPAGVTPTETSKPSLFGTGTVASSETQKP GLFGTQTTPQPPLGPVTTSAETQKPAALAGNLFGATAVATKPSGSLFGAGAPAPAG AGLFGGGGATPTSATATRPPAANLFSATPTTGAASSTGQAGSLFGAAAPASVTAAT APAATAAPSLFGAKPTDKPTTPATTTSAASGSPFGAGPAAAASSTAPLSATTVTPTS ATTAPSALFGGKPPAPTAAATTAATDAAKLTTAASGTTAPAPVGSTPAQPSSRLKNK SLDEMITRWTSDLDKYTAEFNKQATEIAGWDRMLVVNGDKLVELHTETIKATKKQED INKALDYVIGQQDELSAALELYEKQVDDIFQTQIGGPEGMQPADQEREKSYLLAEKL DKQLDIMSKNLGNIITDINNATNTINKTSSAEDPLATIVKILNNHLGALQEIDVRSNTLQ GKIDAAKTQRDASMSNNGLGGQDMNDFFASQAFRGMR
Crypto-coccus neoformans	Fungi	tr|F5HD88	MAAPNPFAGFGSKPQPSASGTSLFGNTSSQPASGSGLFGSSSTTNNSSATPAASG GGLFGGGAQTSGGLFGNNTTGANNNNNNSNAAAANSSTPAAPSGGSLFGGFGTG GFGTNNTATGSTTPASKPAFGGFGQSTTPAAPPPASTGTSLFGGAATGTSTGGGLF GAKPAEGTGAPGAASTTGGFTGFGAKPAGTTSAPATGGLFGSKPAESTPAASSSPA PSSGGGLFSFGAKPASTTTPAAPSLFGSAPAKDASSSTPTSGTPPTTSGGGPFGGG GLFGAKPAAPATEAPKADTATTAPAAPTSGLFGGVGASKPAEAPKPAAGGFSFGNL GAKPATPSTTEAPKTGGFSFGASAPSADKKDEMPAEAPKTGGFSFGAPAAAASNEE KKTDKPAEAPKPGGFSFGNIGTSATTASGDDKGKAPEAPKAGGFSFGGLGAKTDGD KDKAPAAPTPAAPAAGGLFGAKPADAGQSSTAAPSASGGLFGANPNTTAAASTTTP AVPTAPIASAPANVEKPSEPVPNLLRGKALDDIVEGWNKDLEEQVKEFERQAGEVRE WDKILVRNGNQITALRRQVLEAQQTQAAVDEPLNYFEAQQNQLESMLDVYEKEIAK MSNDSTRPLAAKMPADREREKAYTLAEDLNKQLDDLSRNLSQMIEQVNKISTSQSSL DASTSSLTNRPGTPSASAADAASQMPDDPVSQLSAILGAHLRALSSIDSSAGKLSTK VGELETKMGSSGSARGWGLPRR
Wallemia sebi	Fungi	tr|I4Y5A2	MCNWIQFCKHIQTNPLATPSQSSGFNFGGAQTPAKPNTPAFGNQGSTTPAAPPPNT GGFSFGTGSSGFGAFGKPATPGAQTAQPAQPAPSGGLFGGSSSTTPAAAPKPTGG FNFGGGSSFGAQQGGGTGLFGASKPAENSTTPSAPAPASGGFSFGAKPAEAPKPA GGLGFGGLGLGAKPEEKKEEAPKPAGGFTFGASKPEEKKDEAPKTSLFGGAGGFG SAPAAPKPAESAPKPAFGLGGGFGAPKPEEKKEEPAKPAGGFAFGGNTLGSKPEEK KDEAPKPAAGGFTFGNLGGAEKKDEAPKPTAGTSTGGFGTLGGFGAPKEQPKETP KPSGGFAFGGSTAAKPEEKKDEAPKPAGGFSFGGSASKPDDKKDEAAKPAAGGFS LGGLGASKPEEKKDEAPKPAGGFSFGGAASKPEEKKDTTTSTSFQLGGGQDKKDP LSVSALGKSSANAEVKPAPTPSLLRNKTLDEITQRWTTELENQQKDFFRLGNEVKE WDGVLRDNAEQISRLYNQTVSAEQTQLAVDQSLDYIESQQKELDEVLTRYEKETEEL FDGDSNQLQLGVADNEREKSYRLAENVNEQLDDLSRNLSTMIDEVNLLSGGTNKSK DNEEDAQQDVIAQIAAILNAHLSSLQWIDGTSSDLMERVKELDGVVGNIQQSKTYTP NTSTATPLQQSRRGRGGFGLSTLSNV
Puccinia graminis	Fungi	tr|E3JYJ6	MGDANKSNPAPLFGGSSSTSLFGSQAGKPATFGFGGTSPFGASQAATSTTPQTSP TKSSTPSFNFISAPGSNNPGGASGTNAPTSSLFGGGNTIGAASSAPKSIFGNPNPAT GTTSSAAPSIFGGNSTSNTSNIFGGNSSSNTSNIFGGNSSNPTPATSTSNSNQSTAT PAPASKPSLFGNTTGTSMTSSNLFGTPAANSGSAPASTTTSTTFAFGGPPANQPPK DANKSESLFGGLQTPKPAPSTSPSLFGAKPADSSTSNNPQASVNNNAPAAGSATPA TTAAASPSLFAPIAPKPSSTSDLPAKPSTPSPFGNMNNSALTIKSTAPVKSSPLAMNS STTGEGSQANKSATPKPAGTPPATPSTKPNMNLAPSLLKGKTLEDLVARWNSELDE RVEDFKHTANEIAAWDQVLIQNGDQISMLYDELQQIEPMQQSIDQTLDYVETQQQEL SVALDDYERQLSGSQAQDFSASSTGRTRTAAQEREEAYKTAEEVHVQLNDMASSL GTMIAELNSLAGPGNRIDESSLADGTISSGSSSNEDPIVQIAGILNAHLGSLNWIGEIT QELGVKVNELESRVSNTKVEFGLEPSLNHYRQIEFNSDEFNPNLSATVGPSGTSLNS GFGNRIPSGLLSHPRR
Homo sapiens	Metazoa	sp|P37198	MSGFNFGGTGAPTGGFTFGTAKTATTTPATGFSFSTSGTGGFNFGAPFQPATSTPS TGLFSLATQTPATQTTGFTFGTATLASGGTGFSLGIGASKLNLSNTAATPAMANPSG FGLGSSNLTNAISSTVTSSQGTAPTGFVFGPSTTSVAPATTSGGFSFTGGSTAQPSG FNIGSAGNSAQPTAPATLPFTPATPAATTAGATQPAAPTPTATITSTGPSLFASIATAP TSSATTGLSLCTPVTTAGAPTAGTQGFSLKAPGAASGTSTTTSTAATATATTTSSSS TTGFALNLKPLAPAGIPSNTAAAVTAPPGPGAAAGAAASSAMTYAQLESLINKWSLE LEDQERHFLQQATQVNAWDRTLIENGEKITSLHREVEKVKLDQKRLDQELDFILSQQ KELEDLLSPLEELVKEQSGTIYLQHADEEREKTYKLAENIDAQLKRMAQDLKDIIEHLN TSGAPADTSDPLQQICKILNAHMDSLQWIDQNSALLQRKVEEVTKVCEGRRKEQER SFRITFD
Hymeno-lepis microstoma	Metazoa	NCBI| CDS30516	MSGFSFGTPTTQAGAKPTGLNLPSFGNTQAPNNSAPSFSFGSPSNTSVNPAKPAFP FVTSSAPSGSVTASSQPAFGFSSSSNKTSAQSTPFFALSSNSTATTASTTSSLSSLV PTTITTSSTGFDFGNSSKTSTNLSFVTSAAAAAATTTSSTSASSSGFSFGLTSSQPST TAISTTTSVTASGSTTSLTFGTQKTGIALTTTTPSLSTSAFGPFSLGNLVTKPSDSSAA VSNSTLAPASAVSQPSAPSTYTYRQLEELVNKWTYELDEQSRNFESELCRLNKADA LLIANADKISDLHAKVEACKAGQYRIDQELEFVESQQRALEDLLEPLEQAVSDLLPSQ QHADAEREAIFQMCINTDLELGQLLSELREMAERVNAVTAELEPGIESHFPSSSNST STSDNLDKNNNVIGQLAQSEYTRAYGKNEDLRRAYRHGENCVYAATTEKVTLLPIRR VLCNQSAVRAVRFNADGQYCLTAGGNRTIRLWNPEVGRLLKTYTGHGGEVSDVQA ASDSSLIGSGGADTLVVLWDVATGQSLRRWRKHAGRVNAVRFAGPAAAEGELAPS SSLLLFSVGVDGMLFAWDARARTPYPIQTMHEAKDSVNCLTVRRWHIITGSVDRCV RVYDVRKGIMTEDYIGSPVTSVGLSFDNQCLLVASQDSVVRLFDYLNGELLNRYTGH VNKDYRIDCCLLNDDAQIASGSEDSNCRVVMWNLADGAADTTSVLDHSPCSLAWSS DIGDSGSKTEKLTIHPVPFIHSLSPHPSKNALLTAGGDYFWLWSDTKEENDYFCLSFK RYFEDR

Hydra vulgaris	Metazoa	tr|T2MGF0	MAYSFGTKPTTSTGFNFGTSATPAVXFSLGSGSTQPFSFTTPASQSSTASGGFSFG GPSVQTSTSLTGFSFGESKPAAANSXLGNQPSDASKQPVFSGFSFNTSTATTKPTS NITFGSNLSANSSFTAISTNAGIPASSAGGFSAPGSTKFSLSTPNSGFSLPALSTGVS LPASNVGFGLPASTTGFSLPASTGFSAGSSSQPGGFNFGTPASSTSLSFGVSIPNTT SSTSLLSGFNLSTSKSSASTDLGKTVPSSNSLFSGATMPLSSSVATTNLSSSNALPLF SGLSSSSSASSAPLFGSSAATSVPTFGLNSTTSVSSAGLPAVSTTTISAPSVKQMSY KELEETVDKWLHDLGEQEKSFLNQAAQVNIWDKQLIDNGEKITALHNEVERIKAEQH RLDRELDFILSQQEELEEILVPIEEQIKLQPINQSTQHTDIEREQTYRLAESIDSQLKRM MQDLSDVIDHINMANIEPVKGRDESMSQIAKILNAHMDSLQWLDQNTSQLQRRVDE VNQALDTRKREHERTFRYE
Ciona intestinalis	Metazoa	tr|F6THX7	PSNAFSFGQTSAAPATTSNTGFSFGGGGGNNTGFGGGIGTTGKIVLNIMQRCMNTP CQSSSLFGSSTPATQSTGFSFAPVASTATGGSQVTSAGSGLFGSTSGFGFGASTTK PSSQANPSALLNFGSTTTTAATKSMFGLATAQPSTPATGFSQPAQATGLASKPVSL GGVATTAQPVQQTASTGFSLTQQPAKTDGFQLGGLSSGFKLGGLTSSVATTTPAAS GFQLGSTAGTGSGVSAAAPFLSSALASSTNAQQKPAAATTAATTTAAPGGGLSLGG AAATTSSSLGGGIKLPGATAATTTTTATAAPSLRYKDLETRINKWTNELEQQEQLFLT QATQVNAWDKLLIDNGEKITNLNSEFEKVKCDQDRLDQEIDFIRTQQQELEDLLLPLE EKTRQQVSSLAGAVHTHHADVERERTYNLAENIDAQLKQMVQDLKEVIEHINATSQP ADAADPVNQISKILSAHMDSLQWLDSNSGALQQKLNVLVKEVNAHKVEQESRFRLA FD
Crassostrea gigas	Metazoa	tr|K1R138	MSYNSLMKLHTNCGCAVTPHAITPIRFHTMHRHAPASSSTSTPLGGGFSFGQKPAA PGTSAPPFSLGGQPQSSTPAQGGFSFGSSATPASATPGGFSFGQNPGSVPQATPS TQPNAPASTGTQLGGLAGFAMGKMPTASIGTPAAAPVGASAAPTGTTGLTLGATLG TAGAGFSLTGQPAAATKPVGISLGTTQATSTAGPTLGTLGTAASTTITGNPLGTASSG GGITFGTQKTTAAPTLGSLIGGATTAASTTQSTLGFPTPVAATSSLAVSSAAGVTVAA ASAGSKMSYQQLEENINKWMSELEKQEQDFLELATQVNAWDRLLVENGEKITTLNS DMERVKVDQQKLDYELDFIHSQQRELEELLAPLEKAVEQQPNINIQQHSALERENTY QLAENIDAQLKRMLSDLKEIIDHLNSSNINQDQTDPIQQITKILNSHMDSLQWIDQNST LLGRKVDEISKQMEVQKREQERNFRLVYN
Drosophila melano-gaster	Metazoa	tr|Q7JXF5	MVFQLPTTTAAPTGGATSSFSFGLSTGTPAAAPASGAATTAPATKTTFSFGTPAPTA GIGGGDADNSKAQAPPAFGFGLGSGTASAPLTLGTQAAANPASTTSATATGTSAAP PAFGGFTAQPAASVVPTIATSAPNTAATTTGLLGGSGLGAPKTTAAASTTLTAAPSAI ASTQGAAPAPTLSTGGAFANLTTETKTTDSSAVSTASQLSYHQLEEHINKWTLEFEE QEKVFTEQATQINAWDKLLISNNGKIVELNDAVKKVKTDQQVLDQELEFIATQQKELE DSLGPLEKEFVNLPRVDMERSQTYLMVENLDTQLKQMSEDLKEIIDNLNEANKGQDT TDPIIQIGKILNAHMNSLQWIESQSTNISKKLEDIGKIQDSQKRDIFRAPF
Amphime-don queens-landica	Metazoa	tr|I1GJ55	MNVGGGLGQGGGGGGLGTNRFQFPVSQPGGGLGAGLRGIGQTPLQMGQGQTGL TGLTGLNRPQLGQPQIRPTGQMGLTGQHQLGQTGLTGLTSQPQTGLTGLTGLTSQ PQAGLTGLTGLTTQPQTGLTGLTSQPQTGLTGLTGHTSQPQTGLTGLAGLTSQPQT GITDLAGLTSQPQTGLTGLAGLTSQPQTGLTGLAGLKSQPQTGPTGLMGLTSQSQT GLTNQPQTGLTGLTSQPQVGLTGLTGLQGGLPQARPGLTGLQTGPTSSGLTGLQQ MKPTGISHPTTGLAGLTSQPSTGLTGLTSQPTTGITGLTSRPATGLTGLTSQATAGLT SQPVTGLTATSTQARTGLPTGLTGLTSTQPTTGLTGLMSQPKTQPTIGLTQAATGLT SGLPSYGTATGLTANPPVTTLAASSAVTSTGPTTEAPVKKYTYKKLESLIDQWSRDLL NQERIFMQQSQLVGQWDTMLQRNGDRIITLHDQVDKLKTDQKKLDSELDLIGTQQK DLEEILSQLETGLQQQQTQLTESQHPDIERNRIYELVKRIDSQLNSMGHDLKDVIEQM NAEGMQEEDSEVFQIIKILNAHTDSLNWVDRNTAILQEKMRYIAQLTEQHRMEQERS FHLHY
Helobdella robusta	Metazoa	tr|T1G5P4	MPTPTSTTTTTSTVGGFNLAASLAATTPASSASPQLPLLPLSIPQSSSASATASSSSS VAATSTTTTALTSLSATASTTVISSSTTYSQLEDLINKWTTELQEQEKLFLHQATFVNA WDRVLMENGEKITQLNLDLEKMKMDQSRLDEDLDFVLGQQNELEEILKPLEEKVGS LQKPQGYYVAHADIERDQIYRLAESTDGQLKVLSSKLKEIIDHINVNEGGDDDNNDSI RQISKILNAHTDSLQWIDRNTGMYVCMYVCMYVCMYVCMYVCMYVCMYVCMYVC MYVCMYVCMYVCMYVCMYVCMYVCMYVCMYVCMYVCMYVCMYVCMYVC VCV
Schistoso-ma mansoni	Metazoa	tr|G4LWN8	MPDGLGSSSGLKLSNMSGFSFGKPATTSAFAFGSSPFGTSAGTKPTFGVSTSTTSL FSPAVASSSNTAVCSSSLLQNSPSLSLTSTSGFGTVATTSNAFGLSSFASLAKPSTTV STFGTSSITGLGTNSNLTPTSQSALNQPSVNPLPSLLKPATTTSNVGSSFTFGLTTAIS TQSTVTPPISFGTLSSTTVSTGAPTASIVNVHASQPAIPSSIGFGVSSASLSSSAITSTA ATIAMTSYNFGNPSLSTLAKSAAASGFGTSSLGIATRTLGETATTAAAITTSLCATIATT TTSIPSATTTSSVSVTSSQTLTYNQLEELVNKWTLELEEQERYFFDEADRINQWDQT LICNAENITAMYKKVEMCQCEQSRLEQELDFIEGQQRELESLLEPLERAVNELPPGQ LHSDYEREAIFQLATNVDLELGQLLTDLREIADQTNTTTMNVTTGFNSSDNSTTTTNA TKENTMINGNNKLTSSNNGDIMNQITRILNCHMHSLNWIHHNTQEIMDRLKVLNGVS
Arabidopsis thaliana	Plantae	sp|Q8L7F7	MSGFPFGQSNSVGGFSFGSSSATNSSSASSTTSPLSFSFNQSSNPSSTGFGFGSS VSSTPASSTTPSFGFGASSTPSFGFGSSASSSTPSFGFGSSASVTPASTTPSFGFGT AASSSAPAPSLFGSSTTNASSAAPGSSPFGFVTSSASSTATPSSSLFGAPASSAATP SSSPFGAAPASGSTPLFGSSPSLFSAPSSASASNSSLFGASSSAATSTSPLFGAPSS ATGATPSFSVASSAPGSSSSIFGATGSSPSFSVASSASGSSPSIFGATGSSPFFGSS SSAGSTPSLFASSSSGATTSSPSPFGVSTFNSSSTSNTSNASASPFSASTGFSFLKS TASSTTSSTTPSAPPQTASSSSSFSFGTSANSGFNLSTGSSAAPASSTSGAVFSIATT TTTSSSTPAATSAPASSAPASTMAFPSFGVTSSATNTTPASSAATFSTTGFGLASST PATGSTNSFTGFAVPKTSTPASSSQPQTTSPAFSFSLPSSTSTTAPATSSATTTQTTL VVPSSSGTSTAVAPVAGSPKLPSEITGKTVEEIIKEWNTELQERTGRFRKQANAIAEW DKRILQNRDVLLRLEIEVAKVVETQSSLERQLELIETHQQEVDKALQSMEEEAERIYN DERKSLLDDEAASTRDAMYEQSELVERELEHMTEQIRSIIQSVNANQGGELEAIDGM SPLDVVVRILNNQLSSLMWIDEKAEEFSSRIQKIALQGSGGDRELMAPKHWMS
Oryza sativa	Plantae	tr|B9EUR8	MASLFFWCSPTTTAITPVASQAPKLPSEIVGKNVEQIIRDWNNELQDRTAKFRKHATA ISEWDRRILQNRTVLIRLEAEVAKVVETQTSLERQLELIETHQKEVDKALQSMEEEAE RVFQDERLLLREDEAASARDTMFEQSETVENELQHMTEQVKSIIQTLNATQGAEFET ADSMTPFDVAVRILDNQLRSLMWIDEKANEFSSRIQRLPNNSAAAERDSGMPSRVH WLQQSVNCFNSLWSLDEETRGFARYRSLLVPGVFRSVELKSRCYMMRWANEFSS RIQRLPNNSAAAERDSGMPRFWLS

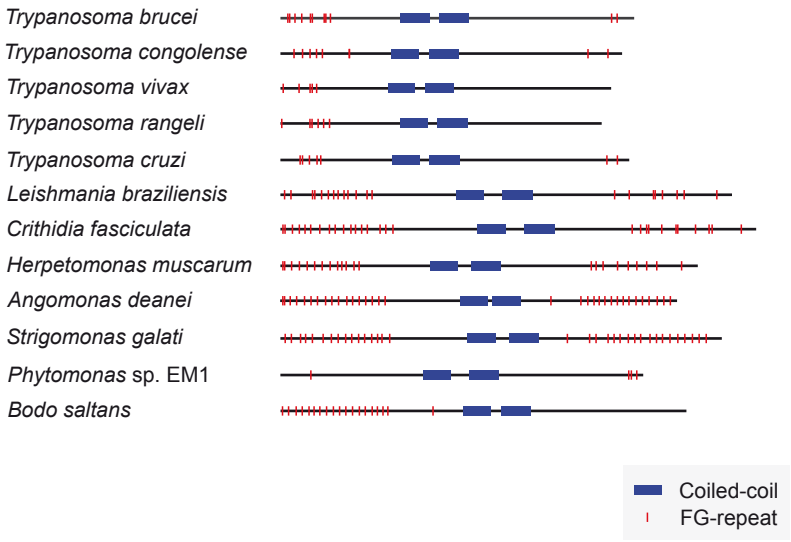
Amborella trichopoda	Plantae	tr|W1PJM5	MAGFSFTGFNLSSSSSSSSSSTTTPTFSFAQSSSAPFSSSSSPSTFSLPSSASPFSS SAPAFSFGTSGSSSSSFTNPSASGFGFGASGSSFSSSLSSGSSASPAFSAFPMGSS SASSSPSFSFQNPPSSAPSFSFSGSSALKPSSFAFASSSSSSSSPSSMASMAPATAV SSAGFDFSISSSSSPSPSVAPATAGSSPNFGISVPATSSSSTPAFSFGPPSSAPATAK ALFGTPSSSSTTTPSLASLSSSTLSSQFPSIFPASSSSPSPLFSFPSSGASKLSSTSAS LTSSTGASSSSSPVSLGSPLFSSSSSLFSGSGLPSGTQSSPLSTSQNPTSGSTGFSF QKPATPTLGVSTASSSLSTTGTAVPLTASSSLSTTGTVVPLTSGAPSLMSSQTSAST SPALPSFGFSFSSSSSSSVATPAIASATDSKIISTKTTTASTITATTTNTSTTAASTSNL SSFSLATKPSSSSSLQTTSVVPSFSFSVSTAASTETGAKFSFASPNAGTTQAAPSFS QSSSAGIMSSKISTPLQAPKLPSEITGKTVEEIIKDWNSELQERTAKFRKQAGAISEW DRRILQNRNVLIRLETELANVVERQHCLERQLELIETHQQEVDKALQSIEEEAERMYN NERGVLLEDEVASTRDSMYEQAEFIEREMEQMSEQIKSIIQTLNTNQGSDLDGMDG MTPLDVVVRILNNQLSSLMWIDEKAGEFSLRIKKLADHGAAVERDLPGFLSW
Physcomitrella patens	Plantae	tr|A9SQI5	MSGFTGFGTSSQSTPTAFSFGTSSAPAFGSTAAGSTPAAGGSLFGGSSAPSFGFGA SPAASSGGGFGSSTFGSTGLFGGASSSSSLFGASPTPAFGTPSSQAASAASPSPSP FAFAQSSATPSASSPAPSLFGASPSPFGSTNAQSSATPAASSSPFGASPSTGSAFS GFGGSFGSSGFGFGATPSSAASAAATAQSSGASSGFGASSLFSGSKPATPAFGAM TPQFGASSSASTTPGFGASSSAFSLSQSTPAATPSASPPGFSFGNITSPAPSFGFGA QSTPATTPAVSSAAASTPFAGFSFGSSAATSAASATPATSSAFGASTTTPSQPQASS SSLFGSSTFGSTTSSSSAPSTSSSLFSMSTPSTPSFSLPASTSATSSSASASTLSFPS SITSAAAASTTPTASSGFGFGTSTPASSAASTQASTPASSGGFSFAGAAPASSASGG FSLSLLAKTSAASTPAVSATTTPSTGFGMGTGLGWSNLSAGPAAATTPAATTTAATS TTTSTSTAATSTAGTSEALTSTPARTPKPPSEIVGKTVEEIIKEWTHELQERTSKFRK QAEALGEWDRRIIGNRNLLIKLESEVATVVESQHSLERQLELIETHQQEVEKSLESME EEAEKLYRDERPSLLEDEAAATRDMMFEQAEFVERELERMGEQIKETIQNINAAQGG DLDIAEGASPLDLVVRILNNQLTSLLWIDEKAGELSGRMQSFADQGALLDKGHRGSR LRGA
Volvox carteri	Plantae	tr|D8U297	MTAFKDVIFVLLVAEEHELLPCYAVLYTPCRPAATSAPAFGAPASAPSFAFGSTTSAF GSATPATPSVFGAPAAAPTAAFGTPAAASAPAIGAPAATSASAFGAPASATAFGAAT SAPAFGAPSTGLSFSQPPAATGASLFGSTAAPAAATSGPAATGFPFGTAPGASSAA ASGGLFGAAPAGGSGGGVFGSTAAPAPAPAAAPAAGGFSFGGTAPAPAAAAASAP AAGPAPAAGAATGFSFGGGAATGASTGASLSGGAAAGPPATSAAAFGALGGGLAG TAPPAGAASSAPAFSFGGAAAPAAGASSAAASGFSLAPAAASSAASGLFGTAPTTT STAPAATSTAAGQTAAGAPGSAAPAAAASSAAAFSFGSAAAGTAPAAAGTAAASAP ASSAAFAFPSAAGATAPAAGTAAASAAGTAPAGTAGALVPAGAAAAAAPASAATQP LLPVSLKGKNIEEIINEWNAELEEQVAAFNKHAASLSAWDRTILHNRSCLLGVEEELG VVAAGQDALDRKLTMLETHHKEVHDALSSIEAEAERMCLAERVLLDGDAAERDRLY ARAEALSTALVRLGEDLGGVVADVNELSGAASGDPSSALGAVVRILNNQLLALGQVE GRVSSLEQEVQALAGGEATSSAVSINSFRM
Chlorella variabilis	Plantae	tr|E1ZFL7	MAGFGGFGGFGGGFAFGAPAASSAAASPFGTPASSAGLSFGAASTPAFGFGAPSS AAAATPGFGAPASSAAAGGLSFGAPASAAAPAVGGFSFGAPASSAAAAAPAFTGFG AVAASTPAAAALASSAAAGLSFGAPAATGGFSFGGASSAAATGLSFAAPASAAAAST GLSFGTPASSAAAGTGLSFGAPASAAAASTGLSFGAAPTPAAATGGGFSFGGAPAA ASSAAAAAGTSAPAFSFASAPAAASSAAAAAPATGAGFSFASAPAAASSAAPAASAA AASTPAFGFGAASTPAAAAASAPTAAAASAPVAGAPAAAGTTPVAALQAPSEVKGK PVDDIINEWNAELEARSRSFVKHAEALAQWDSSILSNRRALLELEEELRRVVRGQES LEKKLQMLETHQKGIHDALVGMEGEAERLYREERPLLDDDSRERDRLYERAEKVGA LLSHLGEQLKEAIADVNDSTSASLGDTAAPLGKAVRILNNQLQALAQADARIEELSQR VADLHPN
Phytophthora parasitica	Stramenopiles	tr|W2QHH4	MSFNFGASSAAPSGGFNFGASSAAPAASTAPSTGGFSFGAASSAPATSTASSSGFS FGSKPAAAASTSSGFNFGATSSTPAAPAEAKSSATSAPSTGFSFGSTAPSSTAPSST AGSTGTSGFSFGAKTPAAEAKPATSSGFNFGATSTTSEAKPATPASTGFSFGATSTT AEAKPAAPASSGFSFGAKPAADAKPAEAKPATGFSFGASSSASSAATSTTTTSTGG FSFGAKPTTSTAESKTETPAVAFGTSTASSAAGSTTTATSTAATTAITAPATETDKPP AEYMGRTIEDIINAWSEQLERNADTFTTEAVKVSKWDSDLMESQRKLGDIAGDVRRI QVAQNELDSNLDTIFAYQMELKSTLEQLEKSVDKMYESQDQMPVAADIEREQTLQL SVDIDDQLNSMTTTLKETVEKLNKAQDDVADDNNPLVQIMKVLNVHHNSLQWIEGSA GRLNSDIAQLSRKLQDSSI
Albugo laibachii	Stramenopiles	tr|F0WL73	MSGFQFGTSNENKAAGSFNFGTGASVGSNPATTNTLSTSSSFFKSPAVNTNTGTTG TDGNTSGFSFGNALNKSNGSRGMGFNFTGAGVKETNPSTSNTNGADNKGFAGGF QPLYSKPTNLSFGSTADTSKNAASNVFGSSSSALSDAKASTAPGASAFSFGNATAS SDPNLKDENAAGSFSSFSQAARTGSDISFKSANTGDNSKAESSVDASKTTTSGSAF SFGNTTASFKPTSTDDTSKVGGFSFTSQPLNFSTTSSEQKQDTTTATTTQASTPSAA FSFTSNTPSTTTSSGSTFSFTTPSSDALSNKTTSSNTPTSTSTFSFNSGASEGKSSS AFSFGGSVPTSSVTSVSGSKTESTLTQSNETSKPIPAKFIGRTVEEIINMWSEQLERN AETFTKEAVKVCNWDMELMESQKLLGDIANDVRRIQVGQKELDVNLDTIFAYQNELN STLSELEQSVEKMYESQDQMPIAADIEREQTLQLAVDVDDQLNTLTDTLKETVESMN QAQRETMDDDNPITQIIKVLNVHHNSLRWIEDNSSRMNQEINQLTKKLSTSTLQ
Saprolegnia diclina	Stramenopiles	tr|T0RJ07	MSFNFGGAAGGATGFSFGNTASAAPAAGATTGFSFGSTASAAPAAPSAGATTGFSF GAAATPAAASTTAPAASTGFTFGGSAPAASATSAAPATTGFAFGASATPAAASTTTP STGFAFGAPAAPAAASTEKPAPGFAFGGTAPASMTPASTGFAFGGASTPAATADKP AASTGFSFGGSSTTTAPATTSAAPATTGFSFGSSAAPATPAATDAKAPASTGFSFGG STPATTDAKAPAATGFSFGDAAKPATPAATPAATGFSFGDAAKTPATTETKAPAPGF SFGATADKPAATPAPATGFSFGASAVKAADDKPAAPSFSFGDAKTTATTTTDAAKPA DASAATTTALPAEYKDKTVEDIINMWSEQLENHAMAFTNEAVRVSHWDSELMENQK KLGDLAIDVRRLQMAQKELNANLDTISAYQLELDSTLETLESSVDKLFENHRQIPDTA DIEREQGLQLSVDIDNQLSMMSTALKETIDRLNLSQAQEDESANPMAQILKVLNVHH NSLVWIDGNATKLATDMATIAKKLQQ
Aphanomyces astaci	Stramenopiles	tr|W4GW85	MSFNFGSAPAAGGASASGFSFGSAAPAAPATAPTSGFAFGGAPAAPSSSTTAPTTG FSFGASSSAPAAPATTTAPATTGFAFGGAAAAPAASTTAPATTGFSFGGAAPAPAAT STTTPAATPFNFGGAAPAAAPAAPTTGFAFGGSSKTTPAATTPAAPSTTPAAPSTTG FAFGGSAAPSAATTTSTPAAPATGFGISSTPASTTETVAPAFSLGGSTSTPAAAAAPS TAFSFGGAAAKPTESATSSTDKPATSFSFGGATATPSTTTPATSSFAQPSDAAAATS GAAGTAVTLQDKPPAEYMDKTVEDIINMWSEQLESHATAFTNEAVRVSHWDTELMQ NQTKLGELAIDVRRLQVAQKELNANLDTITSYQTELESTLEQLESSVDKMFESNRLIP DAADLEREATLQLSVDIDTQLNMMSTALKETIERLNQSSQAAGGGDDTDELHQPIAQ ILKVLNVHHNSLLWIDENATKLTQDMGEIAQKITRP

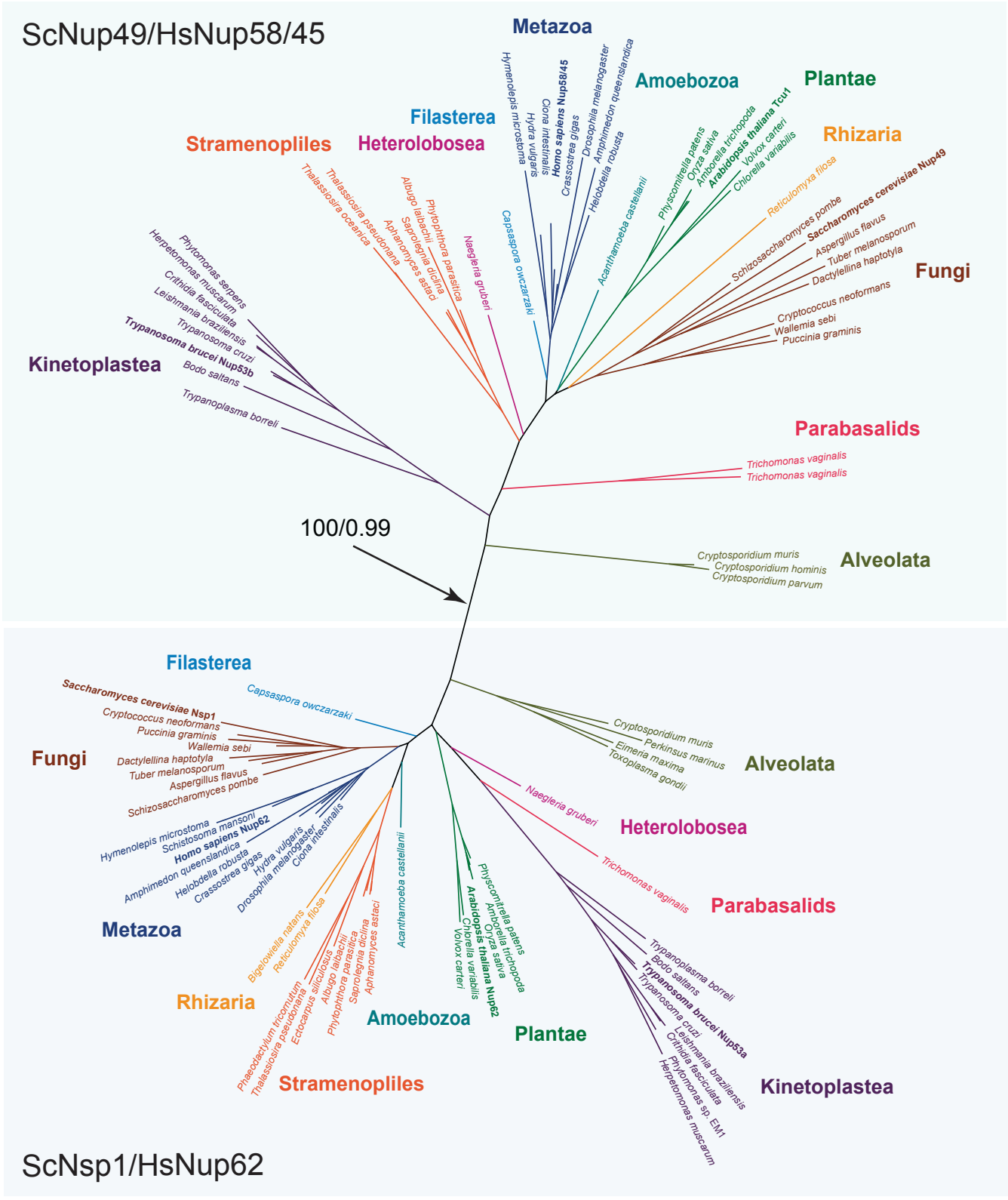
Thalassio-sira pseudo-nana	Strameno-piles	tr|B8C2B6|	MGFSFGAPSTNAPAPSGGGFSFGTSAATTDAAKTATPSTGGFNFGGTPAATTDASK TAAPSTGGFSFGGSAAASTTSAAATPATNGGGLFGSTAGSGDAAKAPAPSFGGISF GAPKSAEESKVAAPSGGGFSFGGANVAAPSDTKTEAIKPPAAAGGFSFGGATSTAG TTTTTDEKKDASATPAPAMGGFSFGGASTTTDTTKDASATSSTPAAKSLFGAVETPA PKAPSPVKTPNDGAVTPGFASPHATTVGASSSTTTSTTPSSKPQMIEPPPIEYQSLTI EQILNRFQSELETDTISFLQEAQRISQYDATLRDTQHSLSELTNMVSRLMLHQSEVDT QLQGIGSYQRELGTTLDQLERNVDELFAAQSGISIQDADIEREKAYERALEVDYKLEQ MGNVLENVVSDLNAAQERVWSSSRGEETKDEEVGKIIGVFNAHHETLAYLESKARA VEADMMMVSQVLAKSGN
Phaeo-dactylum tricornutum	Strameno-piles	tr|B7GE29	MASFNFGSSGGSGTNNSAPGGNSSSRSGGGFSFGGSSSTPAPAPAAGGFSFGAG VGATGGAGSTSAPAFGSSSGGGFAFGAPSTGSSTPTPAPASGGTVSSTGGSGAGA FSFGTPAVASNTTAAPASGTGFSFGATPVTAKTSDSNQKPAPSQSMGSGFNFGGA PSTKQPASTSTSSGGGGGFSLSSSGTSDPLPTLGQNSDSDKHKSTTGGFTFGDSKT PAAASAFTGSDGKAASNPEGGASTSGFSFGGATAAPAPVAAASTPQPEAKSSSFSF GGSTPAPVSTPTPATPKDPVTPAPVPTPGQTAAPAPTITAPSTEPVKLEYQTLTVEET LNVFQKELEKDALAYVAEALRVAEYDAILRDSQRDMAKLAQQTQRCLVQQEEVERV LTGIAAYQTELDGTLETIETHVDELFQAQGALATVDADLERERAYSTAEAITTRFQTLH RSLQETALTLDDTRTRVLQGDVGQIVKILSQHQTSLTELETVGRRVERDIAEVQKALQ QH
Ectocarpus siliculosus	Strameno-piles	tr|D7FRT4	MAFNISAGGAAAKPATGGFSFGASAAPAPAAPAAAAAPNFSFSSTPAAAPAPATTG GGFSFGTKAPTAAAAPAAASGGFSFGAAAPAPAAATASTTATTTAPAAGGGLFGGA AGSTAGTGATGAAKDGTDAANGSAAAGTLTLAAAGGAGTTEQEQPPEQYMNMTVE EIVNSWNVELDQDATTFTNEAVKVSDWDGVLRETQSELFSLADDVQKLVLGQQDLA RSMKAIEGEQSHLDKTLDQLEGQAEKLMHDQRGQSPEEGDVEREQAFQIAQTVDM QLAGMVDTLKSLVDQVNSSTSSSSFGAVGGRGDTGGDSNARKIVRILNAHHHSLTW LEETSKTMLQDAADVGRRLGMPSDAALLPP
Capsaspora owczarzaki	Filasterea	tr|E9CFF0	MAQPVFNPAAAGAPGGAPRPTMGMPAVARPPAFGQIGGAAGAAPVGAMPAMGAL GGGAARPLGGLGMGGLGAAAPPGAAGGLGLGALGAARPTLGGAAPGLGGMPAMG APRPTLGGIGAAAAAAPGAGIGLPGAAAAGAAPAAGGIPSLGAGLAPRPVGAVGAV GAAPGALGGVPTLGAGAPRPAMGLPGAVGVPAAGAVGVPAAGAVGVPAAGAVAA AAPGLGAAAPGLGGAGALGAPRPTLGAAAPGALPAAGALGGVGALGALGAPRPAL GAPALGAAAVGAAAPAALGAGAAAAAAPAAAPVPASAIANSDLKNLSVEDIVNKWTR ELEEMVNTFNTQAIEVAEWDKMLVDNGEQIINLHKEVERIQSSQKDLDQRVEYIYTQ QRELGQLLESLEGDVDQLYNKARSVPHADRARQRTFQLAESMNAQLDEMSKSLKE MISSLNQSTGAQRDEAIPIHQILQILGNHVNALQSIDRNAAHLGTQLQMVQQENLQK MNQYARIQSHRGL
Naegleria gruberi	Hetero-lobosea	tr|D2VQZ0	MFGSSGFNAGGGNPQGNAPGAFSFGNNNSAPTQPATGGGGGFSFGSSTTGGTQP STTGGFGQPSAQPPTSGGFAFGSSTTGGTQPSTTGGFGFGSTPSTQPTTGGTTAG GTTGGFAFGNKPATTATTTQPTTGGMTFGQPSTQPTSTGGTTGGFAFGTQPTTGT TTQPTTGTTGGFNFGSTTQPSTQPTISTTTTTQPSSGGFNFGSTTTQPTTTQPTTGT ATGGTTGGFNFGNTTTGTTTQPTTGTTTGFKIGTTSTTQPTTGTTGGTTGGFNFGN TTTQPSTGTTTTSSTTQPTTGTTGGSGGFNFGSTTTTPSTVAQPTTTGTTGGTTGG FNFGNQPKPVTTQPSTTGTTTQPTTTTTGTTGGGGGFNFGSTATTTTPSTTNAPTS TGTTGGAGGFNFGNKPTTTPTTTTTTGTTGTTNAGFSFDNKRPSDEGGPNKKRSA GSDISTSGNTTTTGTTGGGFTLNTGSTTTPSSTQPTTGTTGAGGFNFTAGSDTSKKP TLPSLDTTNSTTTATTGATTTAQPTTATTTQPKPITTTTPQIDTSQTLLGNSTVEEIINK WNTDLSTDIKDFHKAANLVSKWDKDIMENESKLIGLNDQVNRITAEQSELKGQLDMI DSQQNNLENIIKGLEDYIEKNQSIYDSSKRSQSDREREETYKTAESINCQLDAMQQTL DEMVMQLNKTFEQSVDPHSDFTRIVQVMNNHLACLQWIEQQASGLDSDIQTSSNTL KRLQ
Acantha-moeba castellanii	Amoebozoa	tr|L8H349	MAFTFGSTTGTAGSSFSFGGGDGSTGAAAPSFSFGALAAAGTGGAAAATPSTSAFS FGGAAPSAAAPAAAAAPASGGFSLSFGGAPAGGASTGAAAAPSFSFGAPAAGATTT AAAAPSFSFGGTTAPAAATTTAAAAPSFSFGGAGTAPAATSATAAPASTTSFSFAPA AATTGSTTTSAAPLFSLGGATSSSTTAASAPAAASTAAPSTSFSFNLGGATDTSSAT GSSTTAAATSAPSTSFSFGAGTTAAGTTSAAPSTSTTDSATSTTGAAGGFSLGGSLF APAATSAASTSSAATDSTTTGGIAGLSWGAGSAAASSSSSSASTSTAPTSFSFDGLA TTAAATPSKETAKPTSAKAKEIQVTAALKNKTFEEIMNMWGRELEDQTITFRKQALEL SKWDKMLLDNSGKIMALHGSVKKVEVAQKTLDSNLEIISRQQDELHQLLEQLENEVD KVYTARTSNGQLGGADSERESGYALAEEINSDLDQMANTLKDHINKLNAAHTSAAD SDNPVYQIVEILNAHLHSLQWVEDNSNQLHSKLKTLRTQFKAHQDQQDHLRRIRNDY YYK
Reticulo-myxa filosa	Rhizaria	tr|X6NK44	AQAQAQAQAQAQAQAQAQAQAQAQAQAQAQAQAQAQAQAQAREQSKANEAALK AAKEKQPKEQDKQKEKPDPKKASSDGAAANFGASELGMGSWAADTGAGGFEFGG SWSGADSSGDAAASKESKEKDKDKDKAKDKAKEQASGGEKLSQKELPKAKEKDPA KDKEKEKERKEKKPESTETRKIADWTIDTILHTWRDELEQHVKTFMHQATQVKQWD LKLMEKSSHVIRLQKEVSKVFEAQKTMDMTLEKIKIQQQAMATTLTQVEGSVNQAIQ TLGPNVPQSEVEPRVELYKMAESVNDNLNILHERLQTKIKQLNEENAIDEDNPFGQIV KILNNHMQSLQWIENRSKELSENVDRLESDLKNLPSQ
Bigelowiella natans	Rhizaria	JGI| 134921|aug 1.27_g9629	MPEGFSFDAGGGGGGFDDFGKGFDGGFGLGDTDGKKADGGDAGGFGFGDTGGK KADGGDAGGFGFGDTDGKKADGGDAGAFGFGDTGGKKADGGDAGGFGFGDTDG KKADGGDAGGFGFGDTGGKKADGGDAGGFGFGDTDGKKADGVDAGRFGFGDTD GKKADGGFADLGGDFADKKNDGGDGGGGSNPGGGGGGSGPGRLKPHTVGKIIEM WRNDLQKIGLDWILVLLLAQAQNAEAFTSQATQVMKVEKELLDSGKRIKEVEKNIEKV FKKQNLRELTEKLIVTQKQLNEQTESRMDKNSPLYLIVRTLNQHMDTLHWIEKTSNKL EKKIGKASRELSRTTEY
Trichomo-nas vaginalis	Parabasa-lids	tr|A2FVJ9	MTSLTLNTNKTTGTGIGGGLGKTTGTGLGGGLGGLGKKDAQPIEIPPELKGKTVKQV LEQFEKQLEEQVRQFQNQARQVARWDREIFECLSLMQHLESQINTVEGAQKELAQT TKSLLDEQTEFIKTLTDEKEKIQIPESADQRQRLYHLAFELSNNFISMENNLKSIVEQT DKSSTESTTEVGKIEQIANCHLDAMRWIEHQTSSLEEKLDALTKKLQTIQ

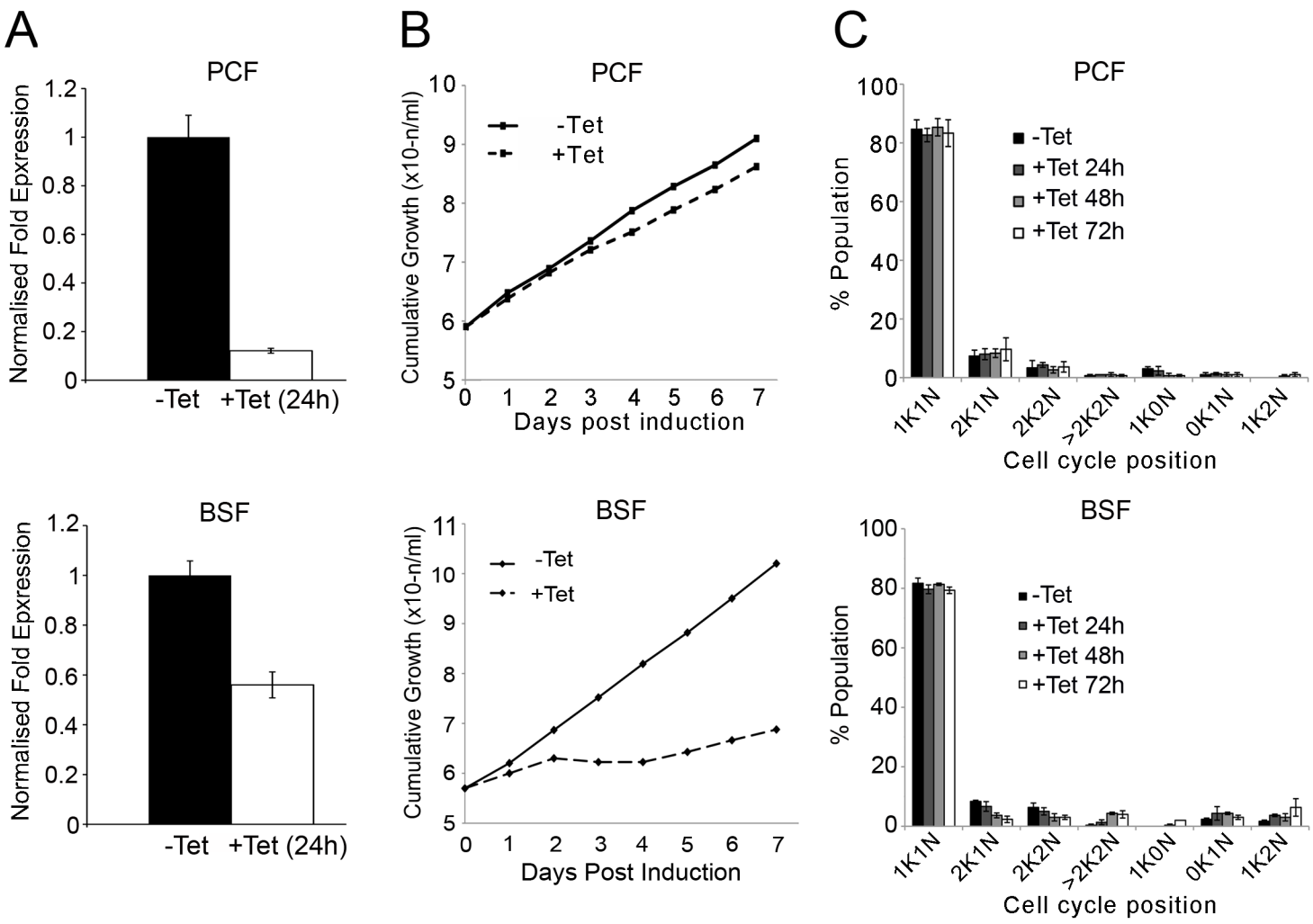
Cryptospo-ridium muris	Alveolata	tr|B6AK04	MFGSTNNTTNIFGNTSLNTSSDNKTPFNFGTNAVSNASSTSIFGTANQSSTSSTNLF GNIGANSSLNLQNGLLGSGLNSTLASTGQQQQKGLNLFGQQKSPGLGLQSTNTTSS QISAISSMNPPMTSNTGTTVDNNKPSLLGQSTLNNQAGTSIGTNTIPFGSTNNVQNV GTLNSGNNLFGSSNLSTSNSNSNFSNSLNVNGINNKALPDTTVISSNDPSSSLNNPT SNLFGQSNTASLNNKIDQNSLFTGPNTKSLSGDSYATTGLPSASTNSESNKLVSGNS NLFSSTLSGTSGIESQAKSETSTKIDIAPINTKNDTNTNNTQGTSNSGQLSTALQLDV STAASLQHERVDDVLKSWESRLAKQVKLFNKASSDVLAVDKAIITYTTLLYSIRSDQQ EMKIRQETMDNRIDQIAQQQNSLASMLRNIEESLSRKLETNLGSGVSTDTSNAQYQN VRISAARANALSTELQEIEGQVDNLMRHLNSVHEKIYPNPLNQIVKILNLHQLTLQSIE DEAMNLKQKLTIAEDCLVRR
Toxoplas-ma gondii	Alveolata	tr|V5BLS9	MFGNTATTSSAASGGGGGGLFGSTSSPFASSSSSLFGGSSGTSKPGGLFGAAPAG SGTATPSLFGGTTGGASLFGAASTSIVSSGQTLSSPSTGSGLFGSASAAKPSLFGST VPASTASAQAASTGTASGSGSALFGALAKPAGADATGAPAGGLFGSSTGAQGTGG AAAATTAPAAGTGLFGATSSASQPSTAGTGLFGATSSASQPSTAGTGLFGAASSSS QPSTAGTGLFGAASSSSQPSTAGTGLFGAASSASQPSTAGTGLFGAASSASQPSTA GTGLFGAASSASQPSTAGTGLFGAASSASQPSTAGTGLFGAASSASQPSTAGTGLF GAASSSSQPSTAGTGLFGAKPAADGAGAHTAEKQATAKGTEAPAASAAPAEGTKAT GGATGLLGSSSLFGDTKAASAASSTGATTSLFGAAAAPAAGGATGTKPAGDSASSS SVSAPFGAGLGASSTANSGSSGNAAAGGLFGAAAAGSAKAPEKLQGASGPAGATA SGATTAETLPPPQQVALETLQHERVEEVLAKWEKRLQRRVRRFNEVAEEVGSVEKA MIEESKKLHALREEQIKIEKRQTYICDFIDGLERQQRDLLTLLASVEASVLRQIPQDNG DPTGAAGGDALAQRVQREWEAESGFHSSSEEELLSRRLRNIDEQLNDVGLALSEAT ERFQPGPLGTVAQVLGIHQAALQASWRQASELQQRMDALQRLTSDAKHGE
Eimeria maxima	Alveolata	tr|U6MA41	MLGGAGSSLFGNMSGSTAQTTSSPATSGTLFGSTGQAPGASTTSSIFGNAAPGSLF GAPTAAAAAGPATGGTASATAPKDGSLFGSSSSSSAPSSGGLFSSGTGMPSTSSG GLLGSNATSGVGSGGSVASGATGFLFGNTTALSGNTQNAPQGSLFGVSAGAASGL SNATKSGLFGGATASNKPNELGKPAGLFGGLSTTGSTGEAPKGGLFGSSSTAATTS GKPDSSSGGLFGSSSAAAPETSQPAGGSSGGKSSAGTALTGTGTLPAGPVAGSGT GDASKGTGLFGSLGDATKTASGGSLFANAASAVAAVGVASGGSDGKGSGLFGTPS GASAAPQHSQTGGQANTAGKPSLFGFAASGSSGSTGGLSSGPAKVSSEANSGQK GSEEAPAPSSSATEQSTTGTTGGQSLSLTGASSNSAAPNAAPAVGSLFGAKSGSSV ESNTSPATGPPVRSTPVVPPEEVALETMQHERMDDLLTNWEKRLQRKVGEFDELA QEVAAVEASLITQSRALATIREEQQRVHRRQLFVGETIDMIEQQQNDISNLLASIEGSL LAKLSPQEQRSICSTVEQSMSERVLDIDAQMDELSDAIAQAARRTQPDPVAAISQVL AVHQAALESATQQCAKLEQCLKSLQRFVA
Perkinsus marinus	Alveolata	tr|C5LD28	MASKRESFSPMKSKRLDEKTTLQELNNRLEMYVLRVKEVQDSRDVAEKELETIRER MQMDLSMTKTRLSKELEDTRKLLEFEIDQKTRLQVLEQEQHTELVKLRTQVKEFGDI RVELEQVQAELAKEKESSKAAKEALALQTTSLQSARRKLKDLDKENRKLTSSLSDTT NELDQLKQKTSEFSLTRDTEITLVRKEMNAKHLEALAAWRRESEERLHSVEAEVRAH FEGQIEQLRSQVDEVNLELDSLKVEYERTANDYDESLKIRQSLTDKLSTIETQYRNER KKFQEDRKMYEANIDNARQARLAKETEFNDLMDIKIALDAEISAYRSILDREESRVGID QANHSKKRKASLTPVKSSTTRQHKRRKSHSTGVLRITYLNLEQGRITLENTGSDALS LSGWQVSSKATNVVFAFPEDYVIQPNGRVSVISGRNAAPTEEEKESMDFYVIKKAM WNTQADVAQLTNPSGDVVSSYAEGMYVDDDDVDAADTPAKDGCGIM
TbNup62 / ScNup57 / HsNup54:			
Trypano-soma brucei	Kineto-plastea	NCBI| XP_844668	MSVLGSGFGRGAPGGFGAPACSTAGGFGSGFNTATTGGFGAGANTATTGGFGAG ANTATTGGFGAGANTVTTGGFGAGANTATTGGFGAGANTVTTGGFGAGANTATTG GFGAGANTATTGGFGAGANTATTGGFGAGANTATTGGFGAGANTATTGGFGAGA NTATTGGFGAGANTVTTGGFGAGANTATTGGFGAGANTVTTGGFGAGANTVTTGG FGAGANTATTGGFGAGANTVTTGGFGAGANTATTGGFGAGANTATTGGFGAGANT ATTGGFGAGANTATTGGFGAGANTVTTGGFGAGANTATTGGFGSGFNTAGGLGS GGFGAGPNTAGGFGTASVSFFGSTAAGAESRPNAVGASQQQVINCQSAVGRYLLEI DHAYNAMHPNCRFRSFLYNVCAPGQSIMAVERERLIYAAAGGECKEEDLLRAQQRN PDPVHLYPTRVHFMQELKNRVEKQKEILEAMSRHVDSLATKADHFRELDEANAAQY RELQQEQAMLQRRWYSLLMKVETLRQLGLPLAEESRMGGIASTLSAQLSAPGMYKT ALTELQPFLDAESSTITSFLRRNSVGGSEGAICTPSEGVGTLRNNRVDQALLRDWAR FAERIQQCVEGLSELLERDAADMRAIYQRVASS
Saccharo-myces cerevisiae	Fungi	tr|E7Q443	MFGFSGSNNGFGNKPAGSTGFSFGQNNNNTNTQPSASGFGFGGSQPNSGTVTTG GFGANQATNTFGSNQQSSTGGGLFGNKPALGSLGSSSTTASGTTAAGTGLFGQQT AQPQQSTIGGGLFGNKPTTTTGGLFGNSAQNNSTTSGGLFGNKVGSTGSLMGGNS TQNTSNMNAGGLFGAKPQNTTATTGGLFGSKPQGSTTNGGLFGSGTQNNNTLGG GGLFGQSQQPQTNTAPGLGNTVSTQPSFAWSKPSTGSNLQQQQQQQQIQVPLQQ TQAIAQQQQLSNYPQQIQEQVLKCKESWDPNTTKTKLRAFVYNKVNETEAILYTKPG HVLQEEWDQAMEKKPSPQTIPIQIYGFEGLNQRNQVQTENVAQARIILNHILEKSTQL QQKHELDTASRILKAQSRNVEIEKRILKLGTQLATLKNRGLPLGIAEEKMWSQFQTLL QRSEDPAGLGKTNELWARLAILKERAKNISSQLDSKLMVFNDDTKNQDSMSKGTGE ESNDRINKIVEILTNQQRGITYLNEVLEKDAAIVKKI
Homo sapiens	Metazoa	tr|Q53H29	MAFNFGAPSGTSGTAAATAAPAGGFGGFGTTSTTAGSAFSFSAPTNTGTTGLFGGT QNKGFGFGTGFGTTTGTSTGLGTGLGTGLGFGGFNTQQQQQQTTLGGLFSQPTQA PTQSNQLINTASALSAPTLLGDERDAILAKWNQLQAFWGTGKGYFNNNIPPVEFTQE NPFCRFKAVGYSCMPSNKDEDGLVVLVFNKKETEIRSQQQQLVESLHKVLGGNQTL TVNVEGTKTLPDDQTEVVIYVVERSPNGTSRRVPATTLYAHFEQANIKTQLQQLGVT LSMTRTELSPAQIKQLLQNPPAGVDPIIWEQAKVDNPDSEKLIPVPMVGFKELLRRLK VQDQMTKQHQTRLDIISEDISELQKNQTTSVAKIAQYKRKLMDLSHRTLQVLIKQEIQ RKSGYAIQADEEQLRVQLDTIQGELNAPTQFKGRLNELMSQIRMQNHFGAVRSEER YYIDADLLREIKQHLKQQQEGLSHLISIIKDDLEDIKLVEHGLNETIHIRGGVFS
Arabidopsis thaliana	Plantae	sp|Q8GYF7	MFGTPSSSPSFGTPSSTPAFGTSSPAFGTPSATPAFGTPSNPSFSSGGFGSSLFSS PFSSQQPQQQQQQQQQQPSSLFQQQPSSNFGFQSPFNNTAQQQQQTPFPNAQ LTTQMAPVAPIPYSLADRDVQAIIEAYKEDPTNPKYAFQHLLFSVTEPQYRVKPAAVS DIMWAEAMSKLEGMDSTERERLWPQLVQGFKDLSQRLKLQDEVLVSDRDRIKTTQS NVKMLQRHLQASTFPSIERLRQKEQSLQRRMLRVMRIIEGLEGKGFRLPLTKGEAEL SEKLTAITRQVKGPGAELSRRVQSLQTISRAQANSIAAGSSLYLPGSTKIDEQSLIDM QEVLQQETEAIGRLGNVLKRDMRDMEIMVAEDTEMALDS

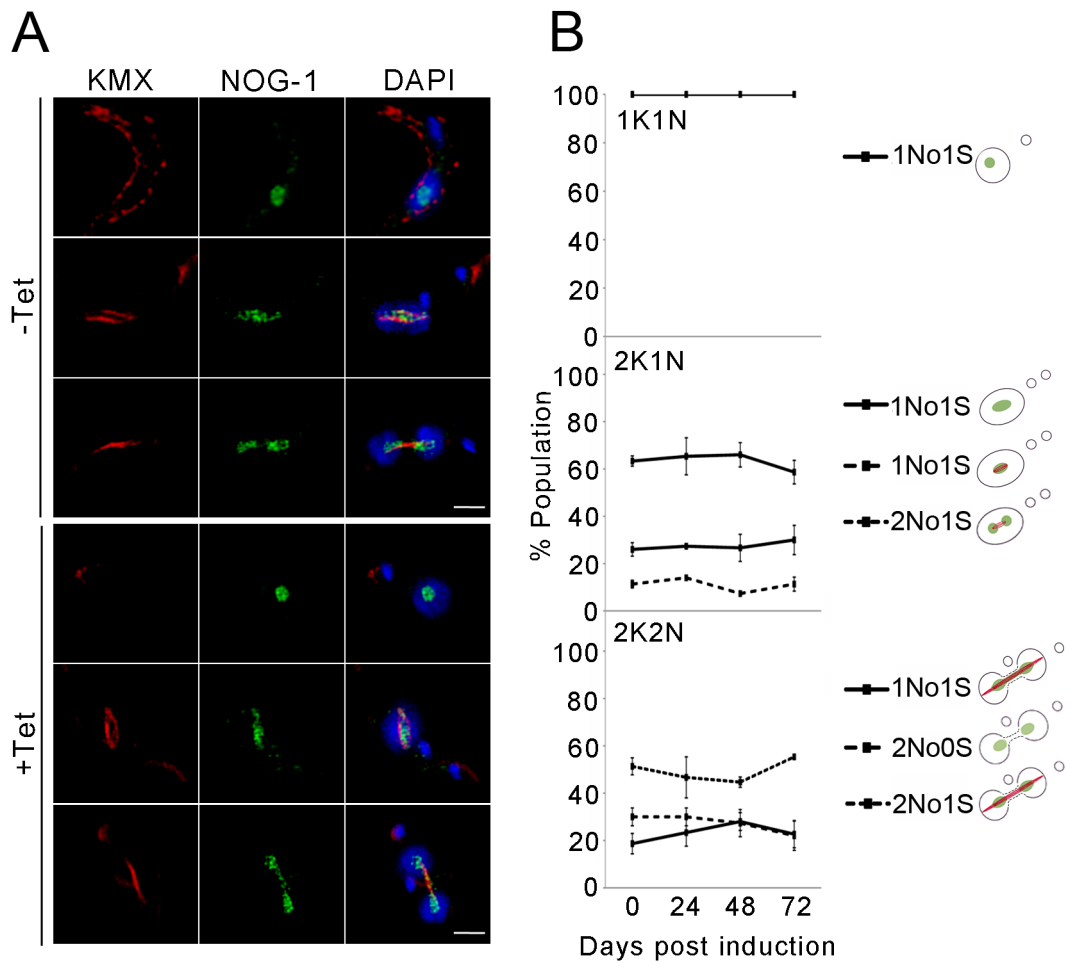

Interphase
Mitosis
GFP
Merge
GFP
Merge
TbNup98
TbNup149
TbNup64
TbNup140
TbNup158
TbNup53a
TbNup110
TbNup89
TbNup53b
Interphase
Mitosis
GFP
Merge
GFP
Merge
TbNup109
TbNup82
TbNup96
TbNup225
TbNup181
TbNup48
TbNup75
TbNup144
TbNup153
TbNup92

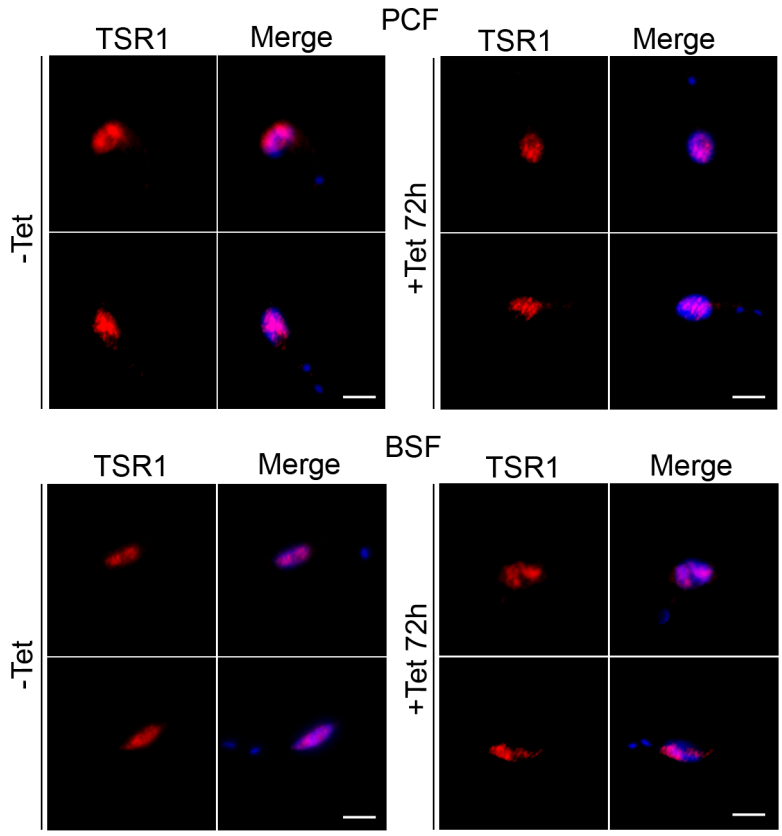
Nup53b ortholog



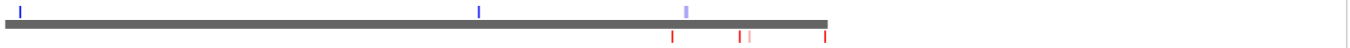

ScNup49/HsNup58/45
Metazoa
Amoebozoa
Plantae
Filasterea
Stramenopliles
Heterolobosea
Rhizaria
Fungi
Kinetoplastea
Parabasalids
Alveolata
Hymenolepis microstoma
Hydra vulgaris
Ciona intestinalis
Homo sapiens Nup58/45
Crassostrea gigas
Drosophila melanogaster
Amphimedon queenslandica
Helobdella robusta
Acanthamoeba castellanii
Physcomitrella patens
Oryza sativa
Amborella trichopoda
Arabidopsis thaliana Tcu1
Volvox carteri
Chlorella variabilis
Reticulomyxa filosa
Schizosaccharomyces pombe
Saccharomyces cerevisiae Nup49
Aspergillus flavus
Tuber melanosporum
Dactylellina haptotyla
Cryptococcus neoformans
Wallemia sebi
Puccinia graminis
Capsaspora owczarzaki
Naegleria gruberi
Phytophthora parasitica
Saprolegnia diclina
Aphanomyces astaci
Albugo laibachii
Thalassiosira oceanica
Thalassiosira pseudonana
Phytomonas serpens
Herpetomonas muscarum
Crithidia fasciculata
Leishmania braziliensis
Trypanosoma cruzi
Trypanosoma brucei Nup53b
Bodo saltans
Trypanoplasma borreli
Trichomonas vaginalis
Trichomonas vaginalis
100/0.99
Cryptosporidium muris
Cryptosporidium hominis
Cryptosporidium parvum
Filasterea
Capsaspora owczarzaki
Saccharomyces cerevisiae Nsp1
Cryptococcus neoformans
Puccinia graminis
Wallemia sebi
Dactylellina haptotyla
Tuber melanosporum
Aspergillus flavus
Schizosaccharomyces pombe
Fungi
Hymenolepis microstoma
Schistosoma mansoni
Homo sapiens Nup62
Amphimedon queenslandica
Hydra vulgaris
Helobdella robusta
Crassostrea gigas
Drosophila melanogaster
Ciona intestinalis
Cryptosporidium muris
Perkinsus marinus
Eimeria maxima
Toxoplasma gondii
Alveolata
Naegleria gruberi
Heterolobosea
Trichomonas vaginalis
Parabasalids
Metazoa
Bigelowiella natans
Reticulomyxa filosa
Acanthamoeba castellanii
Physcomitrella patens
Arabidopsis thaliana Nup62
Amborella trichopoda
Oryza sativa
Chlorella variabilis
Volvox carteri
Rhizaria
Phaeodactylum tricornutum
Thalassiosira pseudonana
Ectocarpus siliculosus
Albugo laibachii
Phytophthora parasitica
Saprolegnia diclina
Aphanomyces astaci
Amoebozoa
Plantae
Stramenopliles
Trypanoplasma borreli
Bodo saltans
Trypanosoma brucei Nup53a
Trypanosoma cruzi
Leishmania braziliensis
Crithidia fasciculata
Phytomonas sp. EM1
Herpetomonas muscarum
Kinetoplastea
ScNsp1/HsNup62

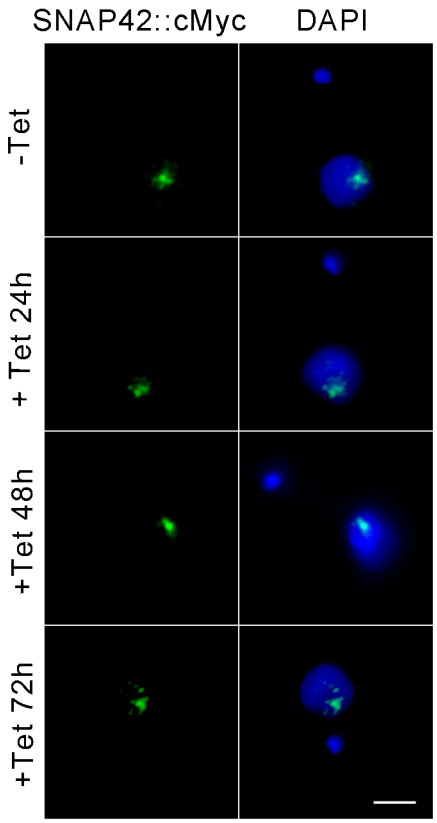

A
PCF
Normalised Fold Epxression
1.2
1
0.8
0.6
0.4
0.2
0
-Tet
+Tet (24h)
B
PCF
Cumulative Growth (x10-n/ml)
10
9
8
7
6
5
-Tet
+Tet
0 1 2 3 4 5 6 7
Days post induction
C
PCF
% Population
100
80
60
40
20
0
-Tet
+Tet 24h
+Tet 48h
+Tet 72h
1K1N
2K1N
2K2N
>2K2N
1K0N
0K1N
1K2N
Cell cycle position
BSF
Normalised Fold Epxression
1.2
1
0.8
0.6
0.4
0.2
0
-Tet
+Tet (24h)
BSF
Cumulative Growth (x10-n/ml)
11
10
9
8
7
6
5
-Tet
+Tet
0 1 2 3 4 5 6 7
Days Post Induction
BSF
% Population
100
80
60
40
20
0
-Tet
+Tet 24h
+Tet 48h
+Tet 72h
1K1N
2K1N
2K2N
>2K2N
1K0N
0K1N
1K2N
Cell cycle position

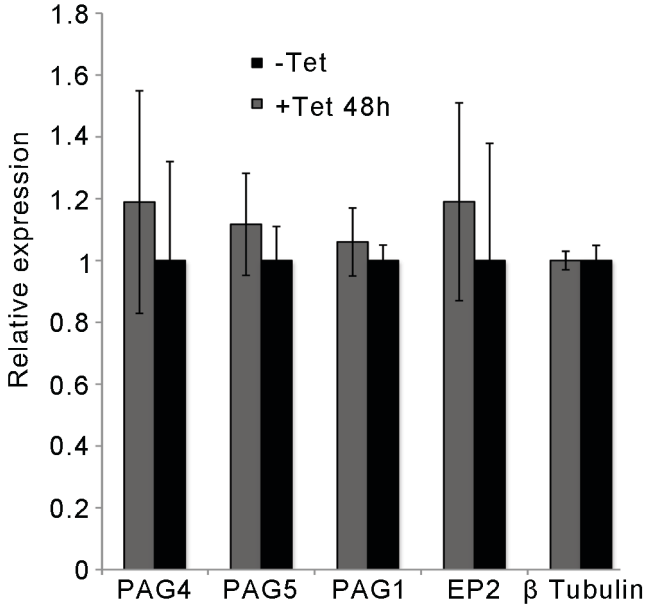

A
KMX
NOG-1
DAPI
-Tet
+Tet
B
1K1N
2K1N
2K2N
% Population
100
80
60
40
20
0
0
24
48
72
Days post induction
1No1S
1No1S
2No1S
1No1S
2No0S
2No1S

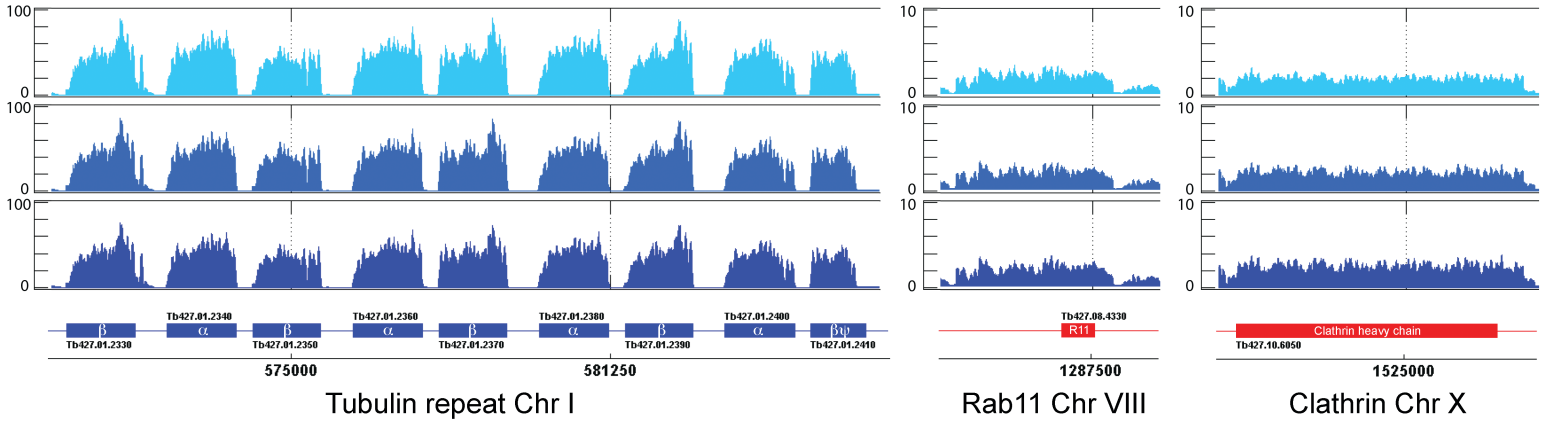

PCF
TSR1
Merge
TSR1
Merge
-Tet
+Tet 72h
BSF
TSR1
Merge
TSR1
Merge
-Tet
+Tet 72h

Genes on forward strand;
Genes on reversed strand;

Sequence	Organism	Chromosome	#Genes	Length	Gene Locations
Tb427_10_v5	*Trypanosoma brucei Lister strain 427*	10	19	4145152	
Tb427_03_v4	*Trypanosoma brucei Lister strain 427*	3	11	1654840	
Tb427_11_01_v4	*Trypanosoma brucei Lister strain 427*	11	11	4977113	
Tb427_09_v4	*Trypanosoma brucei Lister strain 427*	9	9	3058680	
Tb427_02_v4	*Trypanosoma brucei Lister strain 427*	2	8	1194715	
Tb427_07_v4	*Trypanosoma brucei Lister strain 427*	7	8	2206643	
Tb427_01_v4	*Trypanosoma brucei Lister strain 427*	1	7	1064569	
Tb427_08_v4	*Trypanosoma brucei Lister strain 427*	8	7	2482252	
Tb427_05_v4	*Trypanosoma brucei Lister strain 427*	5	4	1609320	
Tb427_04_v4	*Trypanosoma brucei Lister strain 427*	4	1	1591669	
Tb427_06_v4	*Trypanosoma brucei Lister strain 427*	6	1	1619978	


SNAP42::cMyc
DAPI
-Tet
+ Tet 24h
+Tet 48h
+Tet 72h

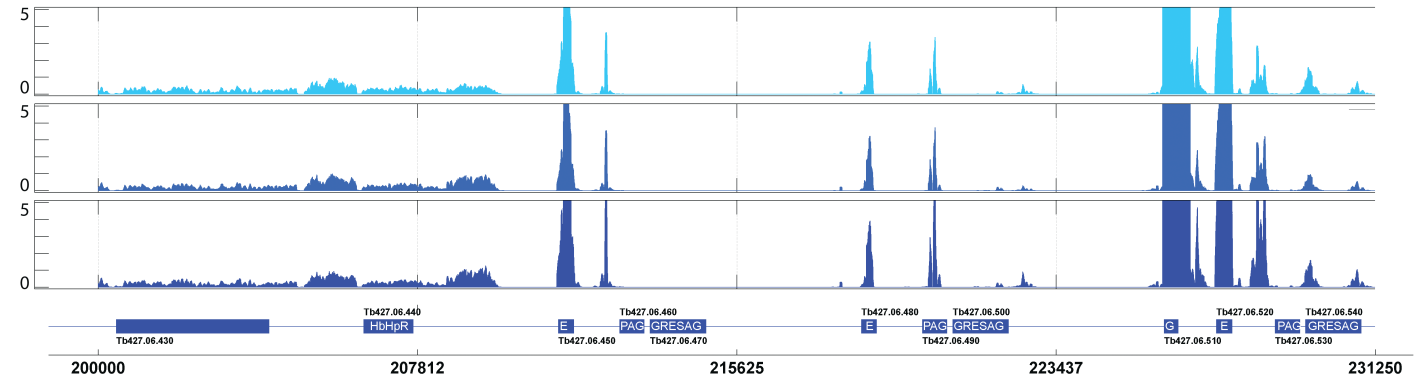

1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
Relative expression
-Tet
+Tet 48h
PAG4
PAG5
PAG1
EP2
β Tubulin



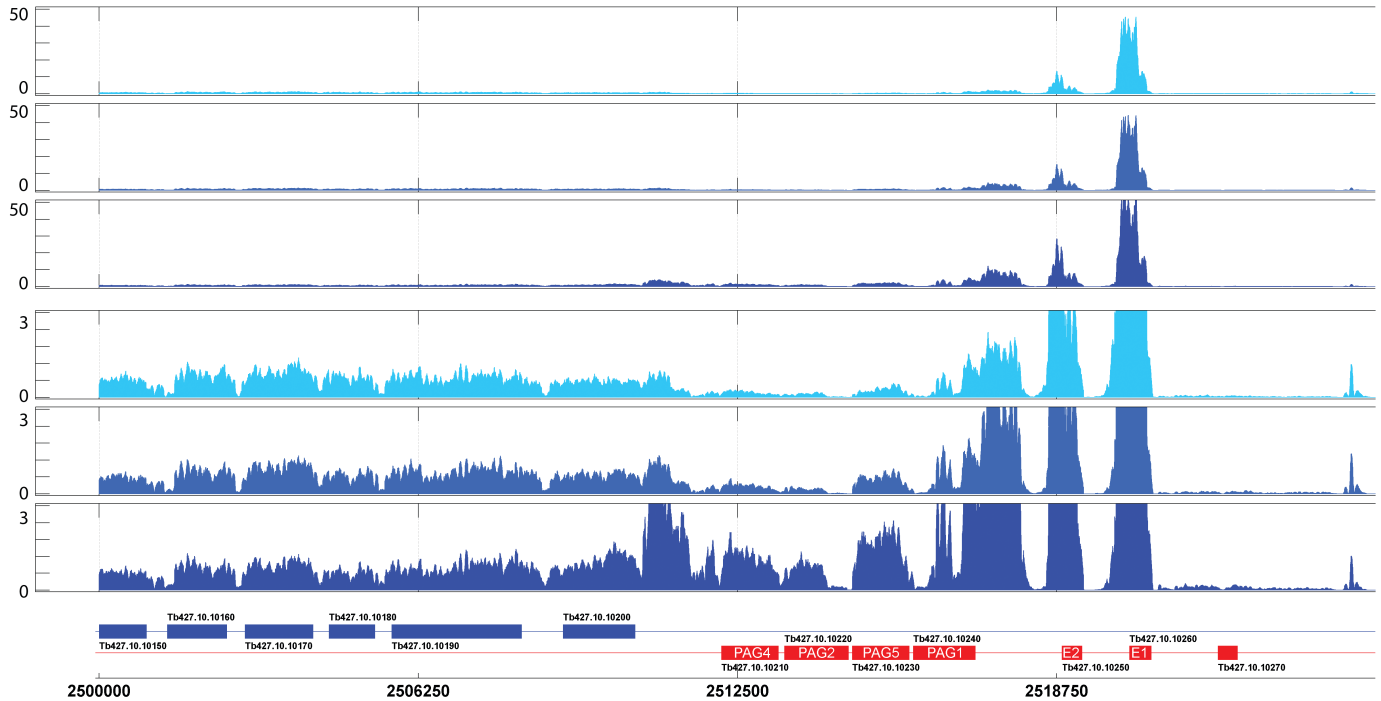
Tubulin repeat Chr I

Rab11 Chr VIII

Clathrin Chr X

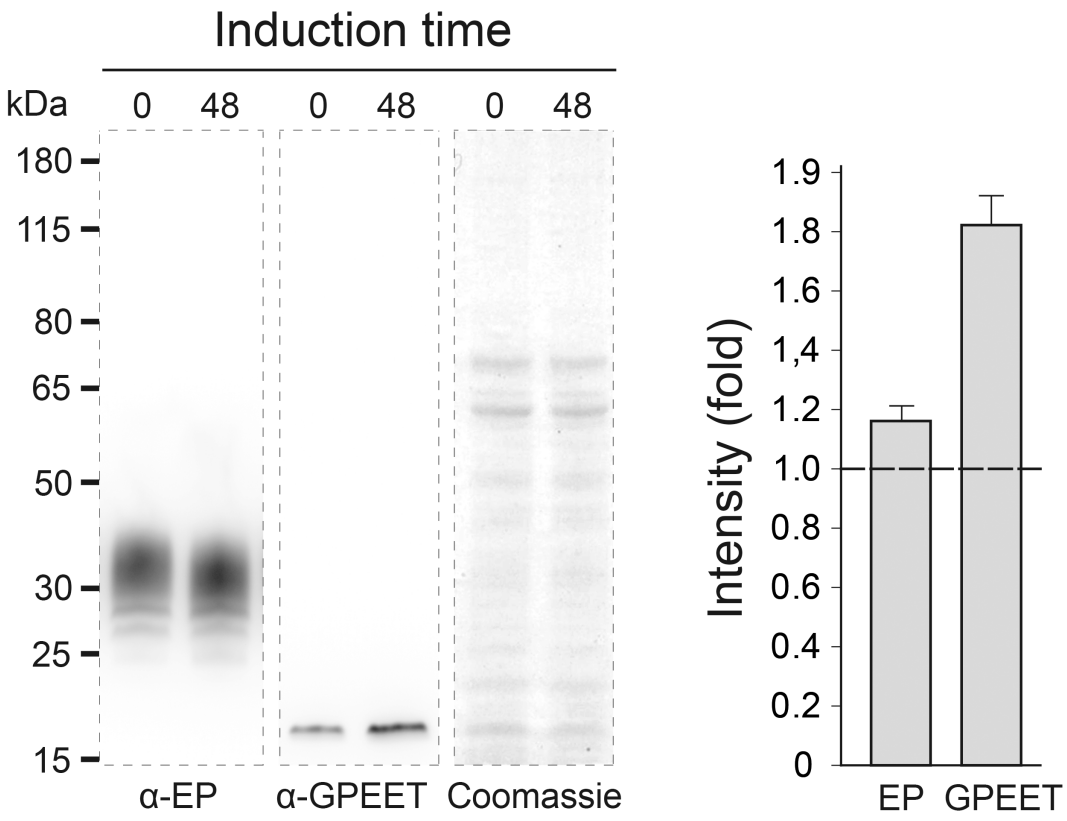


GPEET/EP repeat Chr VI



15x expansion

EP Locus Chr X


Induction time
kDa
0
48
0
48
0
48
180
115
80
65
50
30
25
15
α-EP
α-GPEET
Coomassie
Intensity (fold)
1.9
1.8
1.6
1,4
1.2
1.0
0.8
0.6
0.4
0.2
0
EP
GPEET