

Table S1. Phenotypic data gathered during this study.

[Click here to Download Table S1](#)

Table S2. Top 100 BLASTp hits returned using ZmSCR1 as a query.

[Click here to Download Table S2](#)

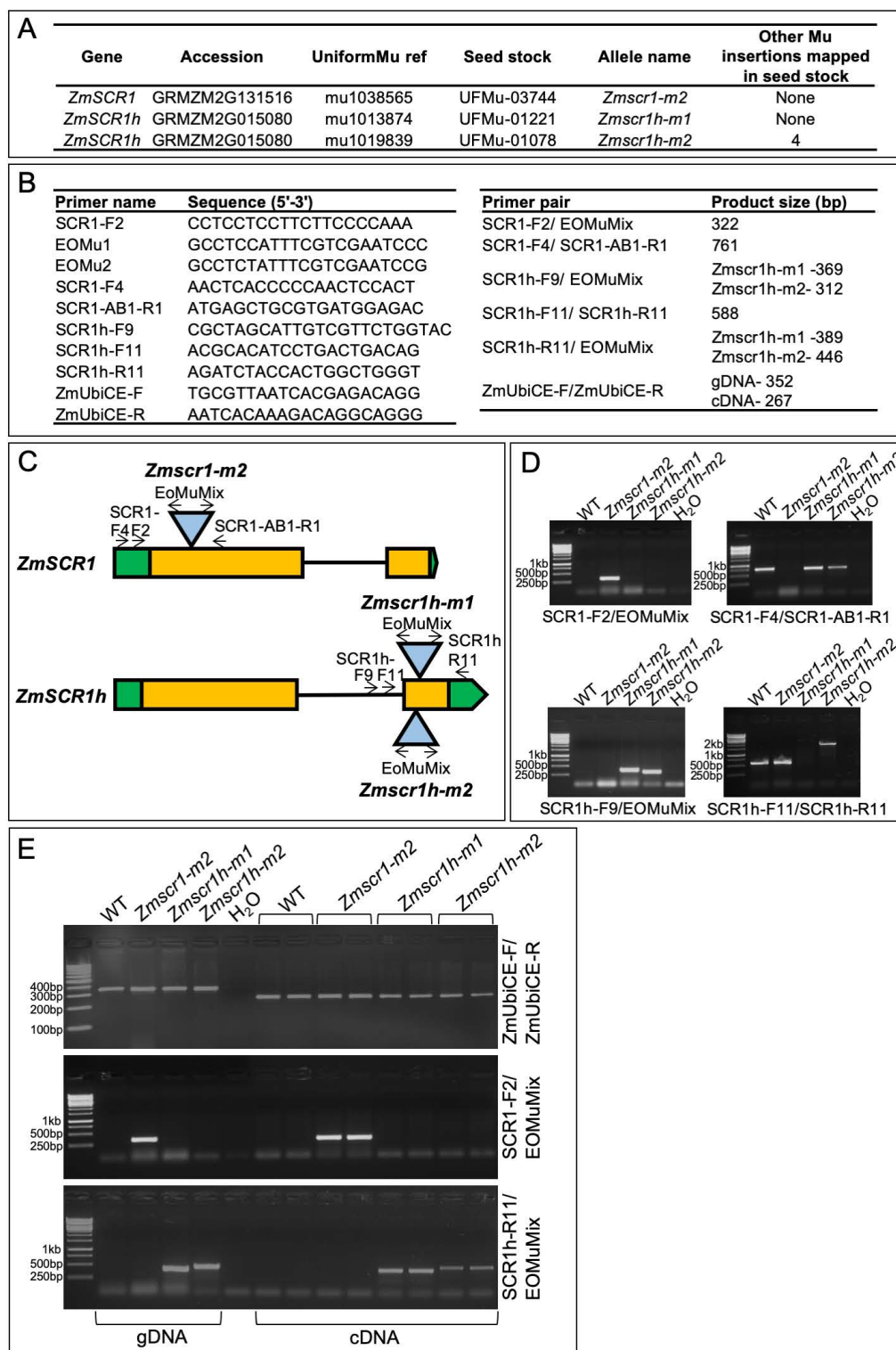


Figure S1. Validation of insertion alleles. **A)** Details of alleles provided by the UniformMu project. **B)** Primers used in this study. **C)** Schematic representation of each mutant allele, with the position of genotyping primers indicated. **D)** Agarose gels showing fragments amplified from WT and mutant alleles of both *ZmSCR1* and *ZmSCR1h*, with different primer pairs as indicated. Genomic DNA was used as template in all cases. **E)** Agarose gels of fragments amplified from genomic DNA or cDNA (copy of RNA extracted from leaf primordia), using primer pairs as indicated. Transposon sequences are present in the transcripts of each mutant allele.

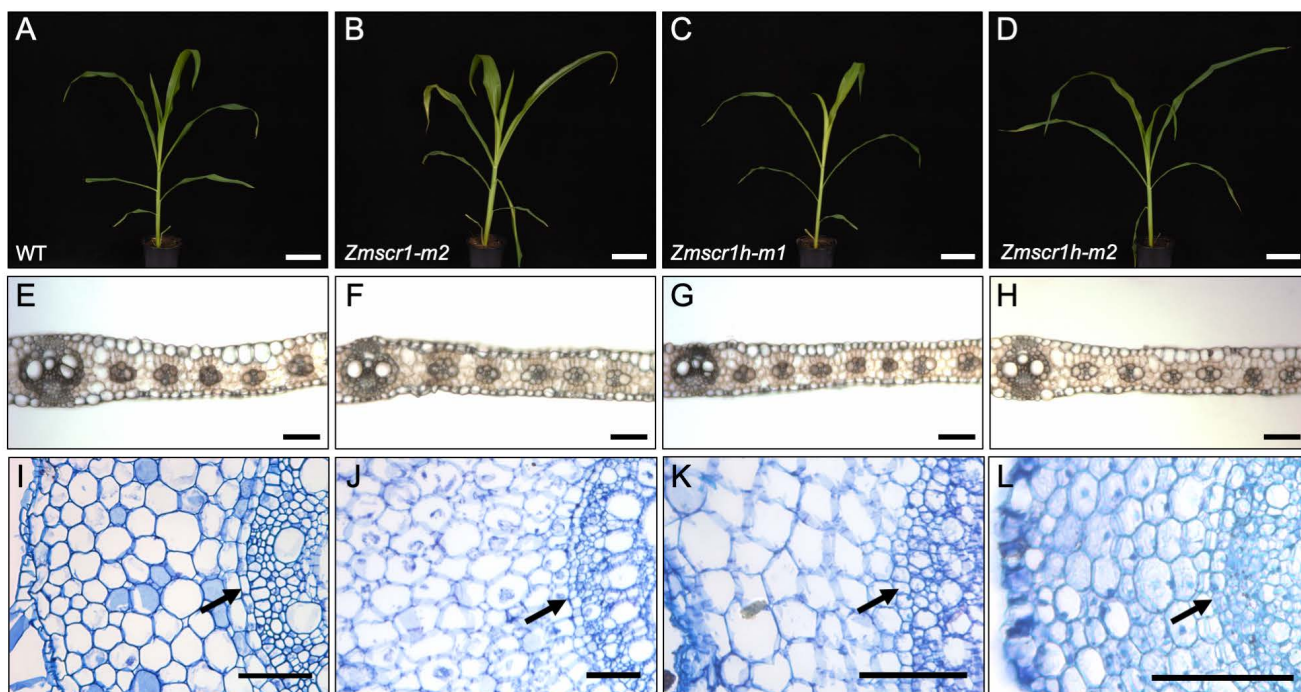


Figure S2. Growth and development characteristics of *Zmscr1* and *Zmscr1h* single mutants. A-D)

Representative whole plant phenotype at 32 days after planting. **E-H)** Representative transverse sections of fully expanded leaf 5 of WT (E), *Zmscr1-m2* (F) *Zmscr1h-m1* (G) and *Zmscr1h-m2* (H) plants.

Representative transverse sections of seminal roots of WT (I), *Zmscr1-m2* (J) *Zmscr1h-m1* (K) and *Zmscr1h-m2* (L) plants. Arrows indicate the endodermal layer positioned between vasculature and cortex. Scale bars = 10cm (A-D); 100µm (E-L).

A	Genotype	Latest emerged leaf 31 days after planting (n=7)	Mean	Mode
	WT (<i>m2m1</i>)	8, 8, 8, 8, 7, 8, 8	7.86	8
	<i>Zmscr1-m2;Zmscr1h-m1</i>	6, 7, 6, 7, 7, 6, 7	6.57	7

B	Genotype	n	Total number of veins across leaf width (\pm s.e.m)
	WT (<i>m2m1</i>)	7	201.54 \pm 3.13
	<i>Zmscr1-m2;Zmscr1h-m1</i>	7	172.69 \pm 8.54
	WT (<i>m2m2</i>)	4	273.53 \pm 5.51
	<i>Zmscr1-m2;Zmscr1h-m2</i>	5	233.96 \pm 11.13

Figure S3. Quantification of *Zmscr1;Zmscr1h* growth characteristics. **A)** Quantification of the latest emerged leaf in segregating WT and *Zmscr1-m2;Zmscr1h-m1* mutants. **B)** Quantification of the total number of veins across the width of the leaf, calculated by multiplying leaf width by vein density. s.e.m indicates standard error of the mean.

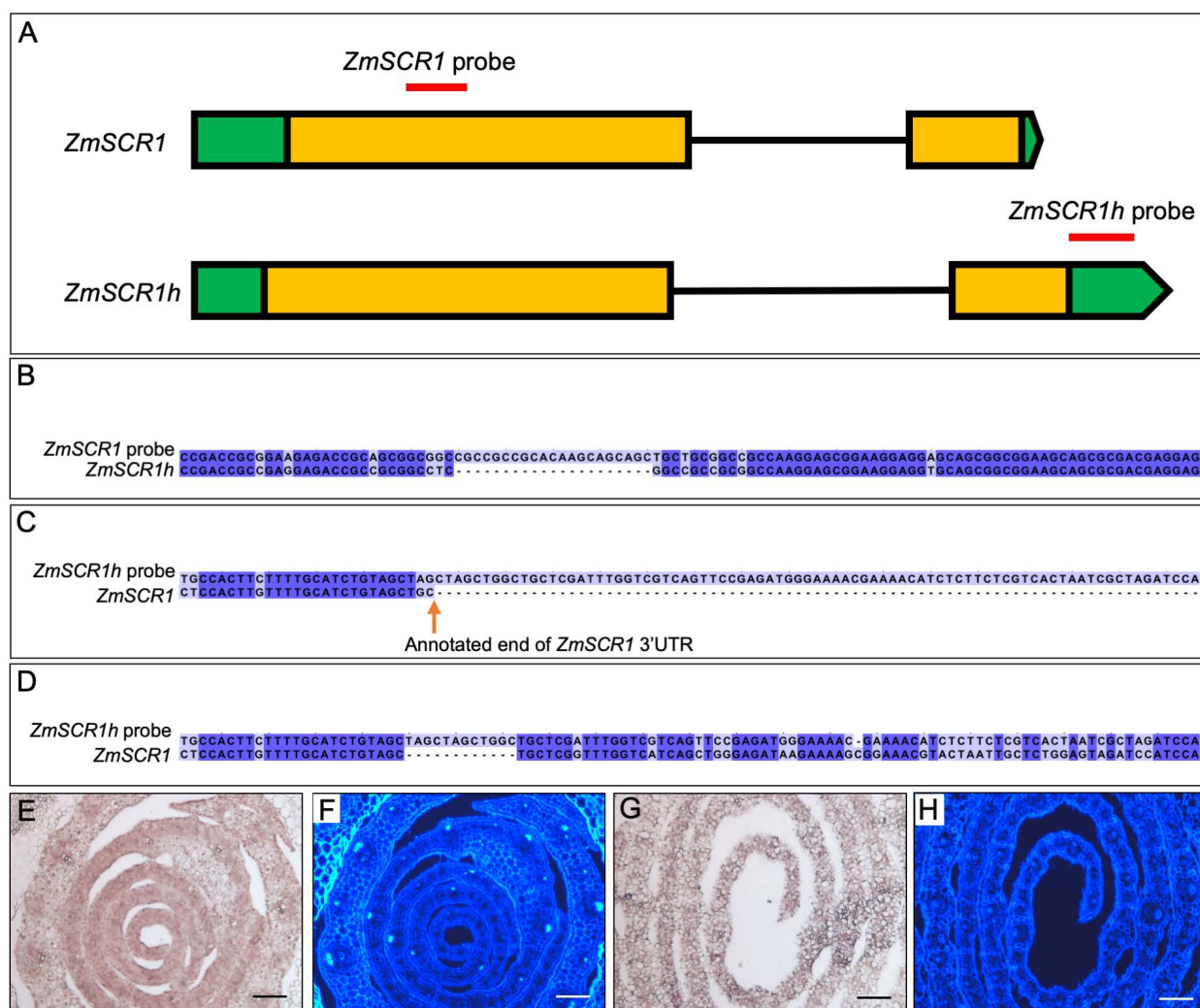


Figure S4. *In situ* hybridization probe design. **A)** Cartoon showing position of *ZmSCR1* and *ZmSCR1h* probes. Green indicates UTRs; orange indicates exons; black lines indicate introns; Red lines indicate hybridization probes. **B-D)** Alignment of the *ZmSCR1* probe with the *ZmSCR1h* gene sequence (**B**); the *ZmSCR1h* probe with the *ZmSCR1* annotated gene sequence (**C**); or the *ZmSCR1h* probe with the annotated *ZmSCR1* gene sequence and region downstream of the of the 3'UTR end (**D**). Dark blue indicates identical sequence, light blue indicates differences. **E-H)** *In situ* hybridization of sense *ZmSCR1h* probe used as a negative control for background signal accumulation. Cross sections were imaged under both brightfield (**A**, **C**) and UV (**B**, **D**) illumination to show hybridization signal and calcofluor staining of cell walls respectively. Both younger (**A**, **B**) and older leaf primordia (**C**, **D**) were hybridized. Scale bars = 100 μ m.

Figure S5. Protein alignment of top 100 BLASTp hits returned using ZmSCR1 as a query.

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-----FP-----ADS-APRMKVEQCLLAPEIRNVVACEGAERV-AR-HERL-DRWRRLMEGRGFEPVPL
SPAA-IGQSQVLL--GLYGA-----SD--GYRLT---ED--KGCLLLGWQDRAIIAASAWQC-----

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-----MRPSQNPEEINEFN
KFYNQPIE-----YQESYFLPSVNNPNNNQSFYADVSAKPA-----
-----QHCVVSSAGNSSELVS-----DSPPIVN----FNPMMNQGS DSC-----RSDMHHS P
DDT--FQS--SGNSSC---YTS DVTDLKHKLRELE-TAMLG---PDSESLSEFNNTIP--VTAANQVP--

----SESDKLVG-----MEMMPSGDLK-EVLIACAKAIAENNLITAEWLMSEL R
TVVSVCGSP-IQRLGAYMLEGLVARLASSGS-----SIYKALR-----CKEPTSVE--LFSYMH
L-LYE-----ICPYFKFGYLSANGAIVDAMKDENSIHIIDFQIA-QG--S----QWITLI
HALA-ARP----GGP----P-RIRITGIDDSTSAYARGGGIEIVGRRLSSIAASCNPFEFH-PVS-ASC
PDI-EI-----EHL-----KVL-----PGEPLAVNFALVLHHPDES VGTQNHDRDLLRMVK
S-LSPKIVTLVEQESN--TN-----TAQFFPRFLETLNYYLSVFESIDVA-----
-----LP-----RDH-KERINVEQHCLAREIVNILACEGAERV-ER-HELL-ERWRSRFVAVAGFKPYPL
SSSV-NATIKTLL--ENY-----YQ--SYTLN---ER--NGALYLGWMNRDLVASC AWK-----

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-----MGSLKNDIIKNEV-----GSEITSFKDQNSYIK-----
-----LLPEDSLASSESKKVTPISSDFELDCGSLIPTSLTFPPG--G
GDDDDVEIQSPDNSIWESFFADQLEA-----DFMIS-----
----SPVRNL-----SSTSTFCTT
TTTHNNNTYT-----HHNQG-----IHGQSMMMCSPPR-SPLRPNNYNSTNK GK
GL-SPFQKVF-----NSPNNQFMQIESFNLPALLES-FLDDDLASEYSTLKV
SDVGS-----SSELSV I PDFLECLALPNSSS--NTSASFMSL
LSNTSVGQ-----VDDEIFQTGSIAPLSQQ-----
-----LHQERHHEK-----QOK--QI-P-----THVQLPSTQQQYTQMIN
HNLVVAAPDQ-----MQEQD SGLQLV-HLLLACAEAVSKEDYMLARRYLHHLN
RVVTPIGDS-MQRVASC FTEALTARLAATLATKPST--SVPKPFN-----PFPPNSLE--ILKIYQ
I-LYQ-----ACPYVKFAHFTANQAI FEAFEAEERVHVIDLDIL-QG--Y----QWPAFM
QALA-ARP----GGA----P-FLRITGVGSYPE-----AVRETGRCLTELAQSLHVPFEFH-PVG-EQL
EDL-KP-----HMF-----NRR-----IGEALAVNSVNRLHRVP--GNC---IGNLLGMIR
D-QAPNIVTIVEQEAS--HN-----GPYFLGRFLEALHYYS AIFDSL DAT-----
-----FP-----GDS-SQRAKLEQYIFGPEIMNIVSCEGMERM-VR-HERL-EKWRRVMEGKGFKGV AL
SANA-VTQSKILL--GLYS-----CD--GYKLT---ED--NGCLLLGWQDRAIIAASAWRC-----

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-----MGGLKSSG-----TSSVVKQKHPPASPT-----
-----ASVSESNIVTSSDPEHLQPDQPERND AIAIPE-----LKF
ELDLGLEVQSPDNAMWDSLFADVAGA-----DFMIE-----
----SPRRDYMV-----CSPRRDYMA-CSPKRENTI SSPKRTFLM-----

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---NNNSYSS-----YHNNN-----YAYVSGVHGLFGCTTQT-TYLSPNH----NKGK  
SL-SPLHKVFNYS-----SSSSTSLLPYASSAEFVRGDESLLL PVVDA-FLD-----EYKEGSN  
AEVGFDFVP-----GSAATSALPTLLECLSMPEMNQYGEDAVAAGEAA  
AGAQQGGGE-----GTDHVYQNWELQQ LASC-----  
-----GGELADVAK-----SEW---AD-P-----SYQDVLGA-----  
---IVPPSDT-----EQEQDSGLELV-HLLLACAEAIKDDYLAARRYLHHLH  
RVVSPVGDS-MQRVASC FADALPLPAVPRRPP-----HLPDSLGR-----STRTSR  
I-IYHDIRCTTRWSHILTAVVCPYVKFAHFTANQAI FEA FEGEDRVHVVDLDIL-QG--Y----QWPAFL  
QALA-ARP----GGA----P-SLRITGVGHSAA-----AVSETGRHLAELAHSLRVPFEFHAAAA-GRL  
EDL-RP-----RML-----HRR-----VGEALAVNAVNR LHCVA---APH---LGPLLAMIR  
D-QAPKIVTLVEQEAS--HN-----GPSFLGRFLEALHYYS AIFDSL DAT-----  
-----LP-----GDS-AARMKVEQYLF GPEIRNIVACEGAERM-AR-HERL-ERWRKVM EGGKGFHGVPL  
SANA-VNQS RLLL--GLYTN-----CD--GYRLT---ED--NGCLLLGWQDRALIAASAWRC-----  
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NTQHLCHP-----YQSASDTHVPEHHYTMK---SHSP-DAVSEEHETR-----  
-----KQYTL DSSAASGCSRH-----DSPSSQSIHTG-----SGSPL--SHEDSHS-  
GSTNGNGS--PVSASC--VT-EDPTDLKQKLDLE-AVMLG---TDSEIVDSLEISVA--NQLS-----  
-----  
----LEPEKWV-----HMMSMPKGNLK-ELLIACARAVEQNSFAIDLMIPELR  
KMVSVSGEP-LERLGAYMVEGLVARLASSGN-----SIYKALK-----CKEPKSSD--LLSYMH  
F-LYE-----ACPYFKFGYMSANGAIAEAVKGEDRIHIIDFHIA-QG--A----QWISLL  
QALA-ARP----GGP----P-FVRITGIDDSV SAYARGG GLELVGRRLSHIAGLYKVPFQFN-AVA- ISG  
NEM-EE-----GHL-----GIV-----PGEAVAVNFTLELHHIPDET VSTANHRDRILRLVK  
S-LSPKVLTLVEQESN--TN-----TAPFAQRFAETLDYYTAIFESIDLA-----  
-----LP-----RED-RERINMEQHCLAREIVNLVACEGEERV-ER-HEVF-GKWKARLMMAGFRPSPL  
SALV-NATIKTLL--QSY-----SP--DYKLA---ER--DGVLYLGWKNRPLIVSSAWH-----  
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NSSRPPRRV-----SHLLDSNYNTVTPQQPPSLT-----  
-----AAATVSSQPNPPLSVC GFSGLPVFPSDR-----  
-----GGRNVMM SVQPM-----DQDSSSSSASPTVWVD A IIRDLIHS-----STSVSIP  
QLIQNVRDII-----FPCNPNLGALLEYRLRSLM-----  
-----  
-LLDPSSSDPSPQTFEPLYQISNN-----PSPPQQQQQHQQQQQ-----QHKPPPPPI  
QQQERENS---STDA-----PP-----QPETVTATVPAVQTNTA  
EALRERKEEIKR-----QKQDEEGLHLL-TLLLQCAEAVSADNLEEANKLLEIS  
QLSTPYGTS-AQRVAAYFSEAMSARLLNSCL-----GIYAALPSRWMPQ----THSL--K--MVSAFQ  
V-FNG-----ISPLVKFSHFTANQAIQEAFEKEDSVHIIDLDIM-QG--L----QWPGLF  
HILA-SRP----GGP----P-HVRLTGLGTSME-----ALQATGKRLSDFADKLG LPPFC-PLA-EKV  
GNL-DT-----ERL-----NVR-----KREAVAVHWLQ--HSLY-DVTGS---DAHTLWLLQ
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R-LAPKVVTVVEQDLS--H-----AGSFLGRFVEAIHYYSALFDSLGS-----
-----YG-----EES-EERHVVEQQLLSKEIRNVLAVGGPSR--SG-EVKF-ESWREKMQQCGFKGISL
AGNA-ATQATLLL--GMF-P-----SD--GYTLV---DD--NGTLKLGWKDLSLLTASAWTPRS-----

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-----MKRDHHQFQGRLSNHGTSSSSSSISKDKMMVMKKEED-----GGGNMD-----DELL-----
-----AVLGYKVRSSSEMAEVALKLEQLETMMSNVQ-----

-----ED
GLSHLATDTV-----HYNPSELYSWLDNMLSELNPPPLPASSNGLDPVLP-----

-----SPE
ICGFPASDYDLKVI PGNA-IYQFPAIDSSSSSN-----NQNKRLKSCSSPDSMVTSTSTGTQIGGVI
GTTVTTTTTTTTAAAGE-----STR-----
-----SVIL-----VDSQENGVRLV-HALMACAEAIQQNNLTAEALVKQIG

CLAVSQAGA-MRKVATYFAEALARRIYRLSPPQN-----QIDHC--LSDTLQ
MHFYE-----TCPYLKFAHFTANQAILEAFEGKKRVHVIDFSMN-QG--L---QWPALM
QALA-LRE----GGP----P-TFRLTGIGPPAP--DNSDHLHEVGCKLAQLAEAIHVEFEYRGFVA-NSL
ADL-DA-----SML-----ELR-----PSDTEAVAVNSVFELHKLL-GRPGG---IEKVLGVVK
Q-IKPIVIFTVVEQESN--HN-----GPVFLDRFTESLHYYSTLFDSLEGV-----
-----PNS-QDKV-MSEVYLGKQICNLVACEGPDRV-ER-HETL-SQWGNRFGSSGLAPAH
LSNA-FKQASMLL--SVFNS-----GQ--GYRVE---ES--NGCLMLGWHTRPLITTSAWKLSTAA--

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-----TFDSYCTLESSSGTKSHPCLNKN--NSSSTTSFSSNESPISQANNNL----SRFNNHSP
EEN--NNS--PLSGSS--ATNTNETELSLMLKDLE-TAMME---PDVDNSYNNQGGFG--QQHG-----

-----VVSAMYR-----SMEMISRGDLK-GVLYECAKAVENYDLEMTDWLISQLQ
QMVSVSSEP-VQRLGAYMLEGLVARLASSGS-----SIYKALR-----CKDPTGPE--LLTYMH
I-LYE-----ACPYFKFGYESANGAIAEAVKNESFVHIIDFQIS-QG--G---QWVSLI
RALG-ARP----GGP----P-NVRITGIDDPSSFARQGGLELVGQRLGKLAEMCGVPFEFH-GAA-LCC
TEV-EI-----EKL-----GVR-----NGEALAVNFPLVLHHPDESVTVENHRDRLRLVK
H-LSPNVVTLVEQEAN--TN-----TAPFLPRFVETMNHYLAVFESIDVK-----
-----LA-----RDH-KERINVEQHCLAREVVNLIACEGVERE-ER-HEPL-GKWRSRFHMAGFKPYPL
SSYV-NATIKGLL--ESY-----SE--KYTLE---ER--DGALYLGWKNQPLITSCAWR-----

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KSSSERMQMFISDERFHYRANSYLSDIYAQAYFTNSSRVHTSHREV-----
-----SSAPYDLMAN-----TRSSII LNTPYNSCFSSAKQPDSLS--SNISHHSS
QSVLDNRS--SEHEVD-----FTEDDIRLKLQELE-QALLNDNDPDQD-----MGIDEEWV
EPIKELLV-----
-----ASS
PKESSESIIYC-----IGNRKEAQTPK-QLLFDCAAAILEDSEIEEAQAIINELR
HMVSIQGD P-QORLAAYLVEGLAARIASSGQ-----GLYKALK-----CKEPPTSD--RLSAMQ
I-LFE-----VCPCFKFGFMAANYAITEAFKGEERVHIIIDFDIN-QG--S----QYITLI
QSL S-TMS----NNP----P-HLRITGVDDPESVQRAVGGLKIIGQRLEKLAEGCGVPFEFR-AIA-SRT
EDV-TP-----AML-----DCR-----PGEALLVNFAFQLHHMPDES SVTVNQRDQLLRMVK
G-LGPKLVTVVEQDVN--TN-----TAPFFPRFVEVYNYYSAVFNSLDAA-----
-----LP-----RES-ADRMNVEKQCLARDIVNIVACEGADRI-ER-YEAA-GKWRARMTMAGFVSCPF
NANS-SGSIRSL--KSY-----CD--RYKVK---EE--GGALYFGWEDKTLVVASAWQ-----

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-----EEE-----EGDGRSAR-G-----KRQQLLGLGPATALASA
AAAE-----EGPETRGLRLL-SLLLRCAEAVAMDQLTEARELLPEIA
ELASPGSS-PERVAAYFGDALCARVLSSYL-----GAYSPLA--LRPL---AAQSR--VAFAFQ
A-YNA-----LSPLVKFSHFTANQAILQALDGEDCLHVIDLDIM-QG--L---QWPGLF
HILA-SRP---RKP---R-SLRITGLGASLD-----VLEATGRRLADFAASLGLPFEFR-PIE-GKI
GHVADA-----AALLGSRQ---RRR-----DDEATVVHWMH--HCLY-DVTGS---DVGTVRLLR
S-LRPKLITIVQDLG--H-----SGDFLGRFVEALHYYSALFDALGDG-----
-----AGA---AEEES-AERYAVERQLLGAEIRNIVAVGGPKR--TG-EVRV-ERWSHEL RHAGFRPVSL
AGSP-AAQARLLL--GMY-P-----WK--GYTLV---EE--DACLKLGWKDL SLLTASAWEPADDAAS
APTG-----

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-----MREIGVLEY
GEMLYTGELDELFR LPAVK TGRSSSPSLPCS NASSQYGLHSQRSELGLSGSPSHRGGMSGNNRVLLPGKF
VLKKGLEPWSTVERRGEQLSSTDPAGSPSFRRAGTTMWPD-----KTSTACEAETSTGQW-----
-----TSPRCGEDPRNEGDL-IHFHQHQNSTSNSPLCPGTPIR---

-----HHYSQMAPSSPLQI ISSPDVKKCIAPMSEPRSVLDLTISP
QQHQLP TIRA-----TLPRRFRETFL EHN VAPVTAPSLSPSRV LNFESCSN-GSTKSGTFADQYGPS
PTNASTWAPDLATQGYPTSIP THKVEELPVLPTAQ SFIQ-ETSS-----
-----LDEWEAATITSPQHKLRAKQWMVSLMED--LRNAEDANSA
QETEECTTPFTPGVDSCAPYFLTSQN-----
-----GLGSPCPSD-----YTGD DTPR-G-----SRLEHLQVESPCGTPRG
GGDG--EDAQ-----NSPVMVGHELV-TLLIACAEAVSTQSLSLVNHL LQKLG
EHAS PQGTA-MQRVAAYFTEGLACRVAHLWP-----HVYQPLPT-----HSNLNDEQ--LQTAFH
L-LNH-----VVPYTKFAHFTVNDIILQAFNGADRVHVIDFDIK-QG--L---QWPALF
QSLA-ERE---CGP---PSHIRITGIGECKD-----DLLETGDR LAEFAEEFNIPFSFH-AVI-DRL

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EDV-RL-----WML-----HVK-----ENEAVAVNCISQFHRLLYDSGET---IKDFLNLIG
S-TKPRVVAIVEQEGS--HN-----SPHFEGRFLES�KYYSAlFDSLEAN-----
-----LS-----RES-CVRVQVEQ-LFALEIRNLSCEGAERV-ER-HEDT-ARWSVLLSQSDFVNVPL
EDSA-NTQAQILL--RMFD-----SD--GYTLT---AE--NGSLTLGWVEQPPLTWSAWKPKDFVLT
GKSLVTNEKQAV-----
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-----MINH
LMSGRVSDMHHHDSSLGLM-QFHD--PHQYMYSSSSSTA--GGSFLLPHHAAFI-----KDV
APAE-PLVEILE-EAP-----GAAGAPAM-QE-----ERKVVDEAA-----
-----EEEEGEE-----AAAESHGVRMI-ALLMECAVAMSVGNLADANGALLELS
QMASPYAASCGERLVAYFARALAARLMSSWV-----GVCAPLSLQ-----QHDDAGIV--IHAAFR
A-FYN-----VAPFARAAYLACNQAVLDAFRGQRAVHIVDLDMV-PGGAL---QWLSLL
PALA-ARP---GGP---PALLRVTGFGVSAA-----LLHDAGNQLAGLAGKLGPFIFY-AVA-KRP
GDA-AAAVSSGLLLP-----GKR-----PGEAVAVHWLR--HALY-DAAGD---EAAAIRLAR
W-LEPRVMTVVDQERSLSSSSSSGAAADD-----GGSFLLDRFVSALHHYSAAFDSLGA-----
-----RPA-----GDD-ASRHLAENGMLGREIGNVLAIAGPSRS-GRERLLP-GSWQAELARHGFLRARW
GSG--GARAQMLA--GACPA-----GL--GYTVA---DDAHDGTVRLGWKGTPLYAVSTWTWCATTHGH
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GITHLSTDTV-----HKNPSDMAGWVQSMSSISTN-----
-----FDMCNQENDVLVSGCGSS---SSIIDFSQN
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--SFSTSSSMVTDSS-----ATR-----
-----PVVL-----VDSQETGVRLV-HTLMACAEAVQENLTLADQLVRHIG
ILAVSQSGA-MRKVATYFAEALARRIYKIYPQDS-----MESS--YTDVLQ
MHFYE-----TCPYLKFAHFTANQAI LEAFTGCNKVHVIDFSLK-QG--M---QWPALM
QALA-LRP---GGP---P-AFRLTGIGPPQP--DNTDALQQVGWKLALAEITIGVEFEFRGFVA-NSL
ADL-DA-----TIL-----DIR-----PSETEAVAINSVFELHRL- SRPGA---IEKVLNSIK
Q-INPKIVTLVEQEAN--HN-----AGVFIDRFNEALHYYSTMFDSLESSGSSSSASPT--
GILPQPP-----VNN-QDLV-MSEVYLGRQICNVVACEGSDRV-ER-HETL-NQWRVRMNSSGFDPVHL
GSNA-FKQASMLL--ALFAG-----GD--GYRVE---EN--DGCLMLGWHTRPLIATSAWKLLPDSGTG
AGEVEL-----
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-----LDHH-----HQYQQ-----HAAAMVRKRPAPDMD-----
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-----NLPPRRRHVTGDLSDVLA AAAA-----PPAAQQQQQLPTAQLPALPAQL---LPPPT-PFQ-  
-----HHQQQQQAA---EQHHHMDVAAANPGG--AA---ATTAFVDGIIRDIIGSCH--GGGHGVSVA  
QLIHNVREII-----HPCNPALASLLELRLLDLPQP-----  
-----  
-----PPPHP---SLL-----PPVSPP-----PPPPPPALPPDKL-----  
-----PAGSPSPK-----PP-----SAEQA-----AAAAQ  
AAAKDRRESQRR-----KQRDEEGLHLL-TLLLQCAESVNADNLDQAALLEIA  
ELATPFGTS-TQRVAAYFAEAVSARLVTSCL-----GLYAPIPPHS-AA---ASITGGRK-IAAAFQ  
V-FNG-----ISPFVKFSHFTANQAIQEAFEREDRVHIIIDLIM-QG--L---QWPGLF  
HILA-SRP---GGP---P-RVRLTGLGASMD-----ALEATGKRLSDFADTLGLPF EFC-AVA-DKA  
GNL-DP-----DKLLN-GSGGGMVAR-----RREAVAVHWLH--HSLY-DVTGN---DANTLGLIQ  
R-LAPKVVTMVEQDLS--H-----SGSFLARFVEAIHYYSALFDSLDS-----  
-----YG-----EDS-PERHVVEQQLSREIRNVLA VGGPAR--TG-DAK FVGSWRDRLARSGFGPASL  
AGSA-AAQAALLL--GMF-P-----SD--GYTLV---EE--NGALKL GWKDLCLLTASAWRPMVHTTPS  
SSAR-----  
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-----RPTSRQP VQVKHYLQPTVLQSTTNNFLSKKQSTEVSQQF---  
-----NGMFR-----  
-----STNANAMHSK-----SSDVGSSGLVTGIRD TSDGFVVV SCKQVKCKQECDIASSSF  
SAPPLSRKRS-----HSDLAE EESC DSELVLGIGRSSVSRGGSEFRNSRAS-SPR KSLKSSDTRLDL  
VSADLCLAPPVLAPEYSSSSSQQEV PSSSMLEVQPFGE SSKVSHSRGPY-----  
-----ASPTESHLSFQKIKSQDASRME--GVT CVSQAES  
HPTGSRCCQPVRPLNLN-----EAIKRECD AVE-----  
-----RERDNEESL-----AQRTHHE-G-----VELGLFPGVFAADTG--  
-----KKSETSGLQLV-NLLHDCAEAVSKGKIETATQKLEELY  
SHASLFGDF-MQRVA AFFTEGLAARMVGKDK-----PMYKNLM-----VQSRLDD--YLSAFT  
T-LYK-----VCPYFQFGHFAANQAI LEAVEGRSVVHII DMDLM-QG--L---QWPGFI  
QSLS-ERE---DGP---P-KLKITGIGTSCN-----SLQDTGRRLASFAETYGV PFEFH-AVV-GEL  
EDL-TP-----MEL-----GAK-----PGEAVAVNCVMQLH RLL-NNGDK---LHNFIAGLR  
S-LHPVMLTLTVEQEAN--HN-----TSSFLGRFVEAVHYAAVFDSLDS-----  
-----LP-----LAS-EERAKIEQLYFAQQIKNIVACEGV DRI-ER-HETL-DLWQKRMVTAGFRQLPL  
SSHA-VTQAKLLL--SLSP-----CG--GYRLS---QQ-PGGSISLWQDQCLLSASSWVL-----  
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DNT--CGS--PLSGCS-----GIDDGDLRHVLRLELE-NKLLG---PESDTDDSCSCSLN--DMVSK-----  
-----  
---PSSVTRWNR-----VLDMAPGLNLK-ELLDACAEAVSDADISTAEALMSALE  
QRVSVSGEP-MERLGAYVLEGIRARLLSSGS-----I IYKCLK-----CKEPTGLE--LLSYMQ  
V-IFN-----MCPYKFA YMSANVVINEAMMNENRIHIIDFQIA-QG--S---QWMFLL
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HYLA-HRP----GGP----P-FVRITGVDDDESAYARGGGLQLV GKRLAEVAKSCGVPFEFH-GAA-LSG
CEV-QL-----ENL-----RVK-----HGEALAVNFPYMLHHMPDES SVTINHRDRLRLVK
S-LSPKIVTLVEQESN--TN-----TAPFLPRFRETLDYYTAMFESIDAA-----
-----RP-----RDD-KERISAEHCVARVUNI IACEGADRV-ER-HELF-GKWRLRLMMAGFTQCQL
SPSV-GETIKHML--KEY-----SP--NYRYA---EG--EGALYLGWKNRALATSSAWR-----

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-----SDHLLLYLDH-QEQH-H-----LAAAMVRKR PASDMD-----
-----LPPRRRHVTGDLSDVTAAAAGA-----PTLSASAQLPALPTQL-----P-AFH-
-----HTDMDLAAP-----APPAP-QQVAAGEGGP-----PSTAWVDGIIRDI IAS-----S-GAAVSVA
QLIHNVREII-----RPCNPDLASILELRLRSL-----

-----NS
DP-APPPPPSHP----ALLPPDATAPPPPT-SVAALPPPPPAQ---PDKRRR-----E-----PQC
QEQEPNQP---QSPK-----PP-----TAEETAAAAAAAAAAAA
AAAKERKEEQRR-----KQRDEEGLHLL-TLLLQCAESVNADNLDEAHRALLEIA
ELATPFGTS-TQRVAAYFAEAM SARLVSSCL-----GLYAPLSPS-PA----GARVHGR--VAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFEREERVHIIDL DIM-QG--L----QWPGLF
HILA-SRP----GGP----P-RVRLTGLGASME-----ALEATGKRLSDFADTLGLPFEFC-PVA-DKA
GNL-DP-----EKL-----GVT-----RREAVAVHWLR--HSLY-DVTGS---DSNTLWLIQ
R-LAPKVVTMVEQDLS--H-----SGSFLARFVEAIHYYSALFDSL DAS-----
-----YS-----EDS-PERHVVEQQLSREIRNVLAVGGPAR--TG-DVKF-GSWREKLAQSGFRVSSL
AGSA-AAQAALLL--GMF-P-----SD--GYTLI---EE--NGALKLGWKDLCLLTASAWRPIQAS-GR

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-----AALGYKVRSSDMADVAQKLEQLEMAMGM--GGAGAAAD--
-----DG
FVSHLATDTV-----HYNPSDLSSWVESMLSELNAPPPPLPPA-----

-----PPAPRLASTSSTVTGGAAAG---GVYFD-LPP
AVDSSSSTYALKPIPSPA-AASA-----DP-STDSAREP-----
--KRMRTGGGSTSSSS-----SSSSLDG-G-----RTRSSVVEAAPPAAQAS
AAASGPAVPVVV-----VDTQEAGIRLV-HALLACAEAVQQENFAAAEALVKQIP
MLASSQGA-MRKVAAYFGEALARRVYRFRPAPD-----SLLDAA--FADLLH
AHFYE-----SCPYLKFAHFTANQAI LEAFAGCRRVHVDFGIK-QG--M----QWPALL
QALA-LRP----GGP----P-SFRLTGVGPPQP--DETDALQQVGWKL AQFAHTIRVDFQYRGLVA-ATL
ADL-EP-----FML-----QPD-GEDTDEPEVIAVNSVFELHRL L-AQPGA---LEKVLGTVR
A-VRPRIVTVVEQEAN--HN-----SGSFLDRFTESLHYYSTMFDSLEGAGSGNSA-----
ADASPAP-----AGG-TDQV-MSEVYLGRQICNVVACEG TERT-ER-HETL-GQWRNRLGRAGFEPVHL
GSNA-YKQASTLL--ALFAG-----GD--GYRVE---EK--DGCLTLGWHTRPLIATSAWRAAAP-----

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-----MIQGVLSRASAAD-----AAAMKAAKRAASIP-----


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TQV-TK-----EML-----EIR-----PGEALAVNFTLQLHHTPDESVDVNNPRDGLLRMVK
G-LSPKVTTLVEQESH--TN-----TTPFMMRFAETMDYYSAMFESIDAN-----
-----LP-----RDN-KERISVEQHCLAKDIVNIIACEGKDRV-ER-HELL-GKWKSRMTMAGFKPYPL
SSYV-NSVIKLL--ACY-----SD--KYTLE---EK--DGAMLLGWKKRKLISASAWH-----
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>Bradilg25370.1.p

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-----MDLHQLLKYRLTGANVLYEIPTENNLTNSSWPA-----
-----SPLKLEYNNSPYTPLSTQLECDNLSALSNTPDNQ-SSTETISAQ---PISPLEADSSYIQPG
SHLRENIQVRADPLYA----RSRHMQHALREIE-TVLMA---PDADDATTSKHEFEETKPAQLMRQR
SRTWSHESRQ-----
-----PLPGVVRPQFASGGYPM
ASYEFRPEKRQR-----ELRDDPQIIVK-QLLTKCAEALSEDRTEEFLKLVQEAR
GIVSINGEP-IQRLGAYLLEGLVARHGNSGR-----NIYRALR-----CRKPESKE--LLSYMK
I-LYN-----ICPYFKFGYMAANGAIAEALRSEDNIHIIDFQIA-QG--T----QWITLI
QALA-ARP----GGP----P-HVRITGIDDPVSEYARGEGLIIVGNMLKGMSKEFNILEFT-PLP-VYA
TQV-TK-----EML-----EIR-----PGEALAVNFTLQLHHTPDESVDVNNPRDGLLRMVK
G-LSPKVTTLVEQESH--TN-----TTPFMMRFAETMDYYSAMFESIDAN-----
-----LP-----RDN-KERISVEQHCLAKDIVNIIACEGKDRV-ER-HELL-GKWKSRMTMAGFKPYPL
SSYV-NSVIKLL--ACY-----SD--KYTLE---EK--DGAMLLGWKKRKLISASAWH-----
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-----MQASQGPQRSCSVH
KLYNKPMQQV-----QQNYTPCRASDNSNYNDGSNSQAQVSLTTEN-----
-----EKFFTVDTFPATDCAIY-----DGDPVSVSVSSNRSPFSSQCSQSN-----MFEQRRSY
EKT--AGS--PVSLCS---GVDDSNKHELRELN-NKLLR---PESDIDDCSCCSLN--GVVSK-----
-----
---HFSLTRRNQ-----VLDVASRLDLK-ELLVACAEAVDEADTSTAENVLMDALE
KRVSVEGEP-MQRLSAYMLEGLRARLLSSGS-----NIYKCLK-----CNEPTSSE--LLSYMQ
V-LYH-----ITPYFKFAYMSANVISEAMKNENRIHIIDFQIA-QG--S----QWVFLI
HYLA-RRP----GGP----P-FLRITGIDDSQSAHARGGGLQLVGERLASIAKSCGVPF EFH-TAA-LSG
CMV-KL-----ENL-----RVR-----HGESLAVNFPYMLHHPDESVMNHRDRLLRLVK
S-LSPKIVALVEQEMN--TN-----TAPFLPRFRETLDYHKAI FESVDVT-----
-----RP-----RND-MQIRIRSEEHCARDVVNLIACEGADRV-ER-HEVF-GKWRSRLLMAGFTPCPL
SPSV-AEAIKVML--KEY-----SS--NYKLA---ES--QGALYIGWNNRALATSSAWQLPHSLPLG
S-----
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-----MDLHQLLKYGLTASDHSCEFPAPRTPAYSDWSA-----
-----NSIKFNLGNSPHSPLLTLQDSDNLSVYSSSISKQRSPIESLSGNIHSQHSPLPQSSLRQFQ
IKFSEFTE--PNSQNT-----ITSQNMRRHALQELE-TVLMA---PDTDEGATSTNPNTDEHKPAKVARQL
SRTWSHESRR-----
-----EPIIMVQPQFTSNRYPV
QSFEVRPEKRPR-----EMKEDPQNKVK-QLLIKCAEALSENKIEEFDALVQEAH
GMVSI SGEP-IQRLGAYLIEGLVARKESST-----NIYRALK-----CREPESTE--LLSYMR
T-LYD-----ICPFYKFGYMAANGAIAEALRSEDRIHIIDFQIA-QG--T----QWITLI
QALA-ARP----GGP----P-HVRITGIDDPLESEYARGDGLQLVGKMLSDMSKKFNIPLEFT-GLP-VYC
PQV-TR-----EML-----DIR-----PGEALAVNFTLHLHHTPDESVDVSNPRDGLLRMVK
G-LSPKVTTLVEQESN--TN-----TTPFLTRFLETLDYYYAMFESIDVT-----
-----LP-----RDS-KERISVEQHCLAKDIVNIIACEGDGRV-ER-HELL-GKWSRSLTMAGFKPYPL
SSYV-NSVIKLL--GFY-----SD--KYTLV---EK--DGAMLLGWKNRSLISASAWH-----

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DSQMPYYNNS--AP---VGENGRIHMAENSLGHYSSSDIGSQRINNSNPQVFE-----
-----AQYCTLESSANGVYPAQ-----SSTSSHSISPL-----SGSPL--SQHDSH-
DHT--YSS--PPSASC---LTEVADLLIKQKELE-NSIVG---PGLDISSDCSRLL--QAHVP-----

-----VRPDNR-----QLLINGGDLM-QVVIACGKAVAENDVFATELLISEL
HLVSVSGDP-MQRLGAYMLEGIVARLSSSGS-----MLYKSLK-----CKEPTSSE--LMSYMH
L-LYE-----ICPFYKFGYMSANGAIAEAIKGENFVHIIDFQIA-QG--S----QWVTL
QALA-ARP----GGP----P-YIRITGIDDSNSAYARGGLDIVGRTLCDVANSCLPFEFN-AVP-AAS
HEV-EL-----QHL-----AIR-----HGEIIAVNFAYQLHHVPDESSTENHRDRIIRMIK
S-INPRVVTLVEQESN--TN-----TAPFFPRYMETLNYYTAMFESIDVA-----
-----LP-----RDD-RRRMSAEQHCVARDIVNLIACEGAERV-ER-HELF-GKWKSRFAMAGFRPYPL
SSVW-NNTINTLL--HTY-----NS--YYRLE---ER--DGVLYLGWKNRVLVSSAWC-----

>Bradi4g44093.1.p

-----MGS--LFFPSSS-----SSSYPPSHASDS-----TAFLHHL-----
-----LDHH-----QH-----AAAAMVRKRPAPDMD-----
-----NLPPRRHVTDGLSDVLAANAA---APPQQQQQLPTAQLPALPTQL---LPPPT-PFQ-
-----HQHQHQ-----EQQHMDVAAANPGG--VA---ATTAFVDGIIRDIIGSCHAGHGGGVSVA
QLIHNVREII-----HPCNPALASLLELRLRSLSP-----

-----AASDLPPHP-----SLQ-----SLPVSPAAALPPPPP-----PPDKL-----
-----ISSPPPQEPSPKQPPPP-----TPEQT-----AAAAQ
AAAKSRRETQLR-----KQRDEEGLHLL-TLLLQCAESVNADNLDDAQSALLEIA

ELATPFGTS-TQRVAAYFAEAVSARLVTSCLE-----GLYAPLPPHS-AA----ASITGGRK-IAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFEREDRVHIIDLDM-QG--L----QWPGLF
HILA-SRP----GGP----P-RVRLTGLGASMD-----ALEATGKRLSDFADTLGLPFEFC-AVA-DKA
GNL-DP-----EKLLNGGGGGGGVGR-----RREAVAVHWLH--HSLY-DVTGN---DANTLGLIQ
R-LAPKVVMTMVEQDLS--H-----SGSFLARFVEAIHYYSALFDSLDS-----
-----YG-----EDS-PERHVVEQQLSREIRNVLAVGGPAR--TG-DAKFVGSWRDKLARSFGFPASL
AGSA-AAQAALLL--GMF-P-----SD--GYTLV---EE--NGALKLWKDLCLLTASAWRPMVQTTPS
SSAR-----

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-----KSASRQPIQVHQYLRPAVLQPTTSVSPSKKQCTEKSQF---
-----NDVFL-----
-----SAHTNAMPSK-----SSDVGSSGLATGIRDTTSDGFVVVSCQMCKQECDIASTSF
SAPPLSRKRS-----HSELA-EESCDSELVLGVGGRSSVSREGSEYRNSRAS-SPRKSQKSSDTRLDL
VSADLCLAPPIVAPEYSSSSSQQEAPSSSMLETQPLGESSKVSHSRGT-----
-----VSPTQSHLSFQKIKSKDVSRAE--GVTCISQAES
HPTGSRCQPVRPLLNL-----EVIKRECDAVE-----
-----RERDNEESL-----AQRNHHE-G-----FELGLFPGVFAADQG--
-----KKSEASGLQLV-HLLLACADAISKNKIEIATQKLEELY
SHASLFGDS-MQRIAAFFTEALAARIVGKDN-----PAYKNLM-----LQSHLDD--YLSAFT
T-LYK-----ICPYFQFGHFTANQAI LEAVEGYSVVHIIDMDLM-QG--F----QWPGFI
QSLS-ERE----GGP----P-KLKITGVGTSC-----SLQDTGRRLAFAETYGVPFEFH-AVV-GEL
EDL-SP-----MEL-----GAK-----PGEAVAVNCVMQLHRL--NNGDK---LQNFISGLR
S-IHPVMLTLVEQEAN--HN-----TSSFMGRFVEALHYAAVFDSLSS-----
-----LP-----LAS-EERAKIEQLYFAQIQKNIVACEGADRI-ER-HETL-ELWQKRMKLAGFRQWPL
SSHS-VTQAKLLL--SLSP-----CD--GYCLS---QQ-PGGSISLNWQDRSLLTASTWVL-----

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-----MVRKRPAPDVD-----

-----LPPPRRHVTGDLSDVTAGAGA--AGAPPHLPPFSASAQLPALPTQLPTAYQFQAHAHQ-
-----HQAGVDVP-----AAHAQ-AAEVAAAAPSTTAWVDGIIRDIIGS-----SGGAGVSV
QLIHNVREII-----HPCNPGLASLLELRLRSLLA-----

-----PA
DP-APLHPP-----LL--H--AAPHVAALPPAPPPPP-----LHSAEKH-----C---PPPPQ
QDQEPNPPAPSQSPK-----AP-----TAEET-----AA
AAAKERKEEPR-----RQRDEEGLHLL-TLLLQCAEAVNADNLDDAHRCLLEIA
ELATPFGTS-THRVAAYFAEAMSARLVTSCLE-----GIYAPLPPGN-PV----AARLHGRGVAAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFEREDRVHIIDLDM-QG--L----QWPGLF
HILA-SRP----GGP----P-RVRLTGLGASMD-----ALQATGKRLSDFADTLGLPFEFC-AVA-EKA
GNV-DP-----EKL-----GVT-----RREAVAVHWLH--HSLY-DVTGS---DSNTLWLIQ
R-LAPKVVMTMVEQDLS--Q-----SGSFLARFVEAIHYYSALFDSLDS-----
-----YG-----EDS-PERHVVEQQLSREIRNVLAVGGPAR--TG-DVKFVGSWREKLAQSGFRAASL
AGGA-AAQASLLL--GMF-P-----SD--GYTLV---EE--NGALKLWKDLCLLTASAWRPIHQAPCR

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CPGK-DVPEFVD-QA-----AAEVSC-E-----QELAVSKEVSEGGGDGA
--VEEQNNGAAT-----TAARGEAAAHGVRMI-ALLMECAVAVSVGNLADANGMLLELA
QMASPYAPSCGERLVAYFTKAMAARLMSSWV-----GICAPLA-----PPFAA--VHAAFR
A-FYN-----VSPLARFAYLACNQGILEAFHGKCLVHIVDLDVV-PGGAL----QWLSLL
PALA-ARP----GGP----P-VLRVTGFGMSAS-----ALHDTGNQLAGLASKLGVPFYFY-AVA-RRP
GD--DADAAAA-AVP-----SRR-----PGEALAVHWLR--HALY-DAAGD---DGATMRLVR
W-LEPKVLTTLVEQERG--APGDGGGGAGN----ERGHFLDRFVSALHHYSALFDSLGS-----
-----RPA-----DED-ASRHLVEHGVLGREIGNVLAVGGPSR--SG-RDKF-GCWQTELARHGFLRAGG
-----GGRAQLVA--GACPA-----GL--GYTVA---DD-QDGTVRLGWKGTPLYAVSTWTWCPSPHAQ
R-----
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AAAE-----EGPETRGLRLL-SLLLRCAEAVAMDQLTEARELLPEIG
ELASPFSS-PERVAAYFGDALCARVLSSYL-----GAYSPLA--LRPL----AAQSR--VAGAFQ
S-YNA-----LSPLVKFSHFTANQAILQALDGEDRLHVIDLDIM-QG--L----QWPGLF
HILA-SRP----RKP----R-SIRITGLGASLD-----VLEATGRRLADFATSLGLPFYFY-PIE-GKI
GHVADA-----AALLGPRHH----HQQ-----QDEATVVHWMH--HCLY-DVTGS---DVGTVRLLR
T-LRPKLITIVEQDLG--H-----SGDFLGRFVEALHYYSALFDALGDG-----
-----AGA--AEEEE-AERHAVERQLLGAEIRNIVAVGGPKR--TG-EVRV-ERWDELRRAGFRPVSL
AGSP-ATQARLLL--GMY-P-----WK--GYTLV---EE--DACLKLGWKDLSSLTASAWEPADDDTVA
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AQGE-SLVEILD-EAP-----AG---AV-EE-----RKGAVDHEAAAAE-----
-----EEEEEE-----ESAEAHGVRMI-ALLMECAVAVSVGNLADANGALLELS
QTASPYAASCGERLVAFARALAAARLMSSWV-----GVLAPLPPQ-----HAAAGISG--IHAAFR
A-MYN-----VSPFARAAYLACNQAVLDAFRGQRVVHVVDMDVV-PGGAL----QWLSLL
PALA-ARP----GGP----PALLRVTGFGASPG-----PLHDAGSQLAGLAGLGLPFYFY-AVP-KRP
GDA-GLP-----LLP-----GKR-----PGEAVAVHWLR--HALY-DAAGD---EAAAMRLAR
W-LEPRVMTVVDQAQAQPERPSSSSSSPS-----AGGFLDRFVCALHHYSAVFDALGAA-----
-----RPA-----GGD-ASRHAEVGVLGREIGNVLAVAGPSRS--GRRREAG-AGWQAEELARHGFLRARW
GAG--GARARMLA--GACPA-----GL--GYTVA---DD-HDGTVRLGWKGTPLYAVSTWTWCATTTTH
GHVRGFD-----
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SNTSFPGALPASLQVQSGGSAGGFFSGSTQTASCNGNQLY-----QNPPSLMNAAPRDSW-----
-----GKI--EDAPSPHHQLSCQYDMEQHGNYGYGVQPAREAVK---
-----DHFSGMDEDSVAAWVDGMIMEMMEA-----MPGVPIE
QILTNLSEVL-----APSNSQLERIIGSRVQSLYGGAGLRVQTFLHTGPSRF-GKRTR-----EGQ
IGWRNAKSSQNEARAY-----QDTPSHHHVRPDNFMEQNAV---ASLARDELHY
P-----RPQKRTIDNLQLSLEPADERSLRHLHTAQQPMPEDQYSHQVLRSDQTTKPVQHQHYFQPHLQ
HQQQKSGEIQNDFSPP-----SNAAQYPI-L-----NTRGFNDAVSLPQNVPQ
STPRNAQPEPP-----NATDEEGLQLL-ALLLQCAEAVSSDDFDQANSILPQLS
ELATPYGTS-VQRVVAYFAEGMASRLVITYCL-----GICPPLSSK-----QLVSNQS--FLSAMQ
V-FNE-----ICPFVKFSHFTANQAI FDAFEGMFMNVHVIDIDIM-HG--L----QWPPLF
QLLA-SRP----GGP----P-HVHITGLGTSIE-----TLEAT-----
-----DAVAVHWMH--HSLY-DVTGS---DLNTLNLLIE
K-LNPKVITLVEQDLR--H-----GGTFLSRFVEALHYYSALFDSLGS-----
-----YK-----ADS-PERHMVEQQLLSCEIKNILAFGGPAR--TG-EAKF-DQWRDELGKR-FKPVSL
SGKA-AHQAAALLL-QGLF-P-----CE--GYTLL---EH--RGTCLKGWKDLYLFTASAWTNE-----
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AAAE-----EGPETRGLRLL-SLLLRCAEAVAMDQLTEARELLPEIG
ELASPGSS-PERVAAYFGDALCARVLSSYL-----GAYSPLA--LRPL----AAQSRR--VAGAFQ
S-YNA-----LSPLVKFSHFTANQAILQALDGEDRLHVIDLDIM-QG--L----QWPGLF
HILA-SRP----RKP----R-SIRITGLGASLD-----VLEATGRRLADFATSLGLPFEFH-PIE-GKI
GHVADA-----AALLGPRHH----HHQ-----QDEATVVHWMH--HCLY-DVTGS---DVGTVRLLR
T-LRPKLITIVEQDLG--H-----SGDFLGRFVEALHYYSALFDALGDG-----
-----AGA--AEEEEA-AERHAVERQLLGAEIRNIVAVGGPKR--TG-EVRV-ERWSDELRRAGFRPVSL
AGSP-ATQARLLL--GMY-P-----WK--GYTLV---EE--DACLKLGWKDLSSLTASAWEPADDDTVA
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CTSK-GVAEFVDPEA-----TAEVGG-E-----QGFVSKVSEGGGDGA  
--VEVEERNDAA-----TTARGEAAAHGVRMI-ALLMESAVAVSVGNLADANGMLLELA  
QMASPYASSCGERLVAYFTKALAARLMSSWV-----GICAPLA-----PPCAA--VHAAFR  
A-FYN-----VSPLARFAYLACNQAI LEAFHGKRLVHIVDL DVV-PGGAL----QWLSLL  
PALA-ARP----GGP----P-VLRVTGFGISRS-----ALHDTGNQLAGLASKLSMPFEFY-AIA-RRP  
GDA-VVGAAAA-DMP-----SRR-----PGEALAVHWLR--HALY-DAAGD---DAATMQLVR  
W-LEPKVLTLLVEQERG--SPGDGGAGAGAAGHDEHGHFLDRFVSALHHYSAMFDSL GAS-----  
-----RPS-----DED-ASRHLVEQVGLGREIGNVLAVGGPSR--SG-RGKF-GCWQAELDRLGFLRAGG  
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R-----  
>Sobic.001G120900.1.p
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-----DG  
FISHLATDTV-----HYNPSDLSSWLESMLSELNAPPPPLPPA-----  
-----  
-----TTPPAPRLASTSSTVTSGAAAG---AGYFD-LPP  
AVDSSSSTYALKPIPSVAVASA-----DPSSTDSTREP-----  
--KRMRTGGGSTSSSS-----SSSSSMDG-G-----RTRSSVVEAAPPATQAP  
AAANGPAVPVVV-----MDTQEAGIRLV-HALLACAEAVQQENFSAADALVKQIP  
MLASSQGGA-MRKVAAYFGEALARRVYRFRPTPD-----TSLLDAA--VADFLH  
AHFYE-----SCPYLKFAHFTANQAI LEAFAGCRRVHVDFGIK-QG--L----QWPALL  
QALA-LRP----GGP----P-SFRLTGVGPPQH--DETDALQQVGWKLQFAHTIRVDFQYRGLVA-ATL  
ADL-EP-----FML-----QPE-GDDKDEEPEVIAVNSVFELHRL--AQPGA---LEKVLGTVR  
A-VRPRIVTVVEQEAN--HN-----SGTFLDRFTESLHYSTMFDSLEGAGSGQS-----  
TDASPAA-----AGG-TDQV-MSEVYLGRQICNVVACEGAERT-ER-HETL-SQWRGRLVSGFEPVHL  
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RQVSSTGDS-SERVASCFFEALATRF SRVSGT-----EINELLSSP-----TQEPSSEE--ILSAFL  
A-LNQ-----VTPFMRFAHLTANQALLEALTGEDFVHIVDL DIG-HG--V----QWPFFM  
QALA-DIR----GEEGHTIQ-HLRITGVGKDRE-----MLDRTGTRLAEFAQSIQLPFEFT-PLV-QAP  
ENL-IP-----SMF-----GLR-----IGEAVAFNCMLQLHQLLAKGSEK---LTSFLYMLE  
S-LTPRVVTLAELEAS--HN-----QPHFLDRFAEALNHYSTLFDSL DAT-----  
-----LP-----PTS-PERIRVEQTWYKMEI INIVACDGTERT-VR-HQRC-EQWRRFFERAGFQLLPT  
SRFA-TSQARLLL--RLHYP-----CD--GYRLV---EDVEDGCLLLGWQDRPLFCVSSWHPSNM-----
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-----MDNVRGSIMLQ---PLPEIAESIDDAIC--HELS-----

-MWPDDAKDLLL-----IVEAISRGDLK-LVLVACAKAVSENNLLMARWCMGELR
GMVSI SGEP-IQRLGAYMLEGLVARLAASGS-----SIYKSLQ-----SREPESYE--FLSYVY
V-LHE-----VCPYFKFGYMSANGAIAEAMKDEERIHIIDFQIG-QG--S----QWIALI
QAFA-ARP----GGA----P-NIRITGVGD-----GSLVTVKRRLEKLAKKFDVPPFRFN-AVS-RPS
CEV-EV-----ENL-----DVR-----DGEALGVNFAYMLHHLPPDESVS MENHRDRLLRMVK
S-LSPKVVTLVEQECN--TN-----TSPFLPRFLETLSYYTAMFESIDVM-----
-----LP-----RNH-KERINIEQHCMARDVVNI IACEGAERI-ER-HELL-GKWKS RFSMAGFEPYPL
SSII-SATIRALL--RDY-----SN--GYAIE---ER--DGALYLGWMDRILVSSCAWK-----

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KSHGSPISPLS-----PQDSSHAASDNGQRMSSGGWNSASYQSESSSHSDTSLE-----GH
VKQEEADYYGRQYGHIEQSEGLAYH-----NSPSSVLKMPYPGAI AQGYS-----MPNYQQDG
RHVPDGGQYAQSQSNCA-----QRNPEMVHMLQVLE-NALLD-----DDDDDD-----HRAPEGNWA
DTIEKFLAADNSAIKPSPVTSRTTQ-----
-----PDYGKQOCNENAINFTG
AVTARVEELALQ-----KLVVATRSRSE-QLLVACAEAVSNNDMPLANVLI AQLN
QEVSIHGDP-MQRLAAYMVEGLVARVAASGK-----SIYTSLK-----CKEPPTRD--LLSAMQ
I-LYE-----VCPYFKFGYMAANGAIAEAFQNESRVHIIDFQIA-QG--T----QWTTLI
RALA-ARP----GGP----P-HVRITGIDDPMPGPTPNVGVEMV GKRLANLAEAVGVFVFH-PVA-KKG
TEI-EA-----WML-----ERQ-----QGEALAVNFALQLHHPDES VCTS NPRDRMLHMIK
G-LNPKVMTLVEQESN--TN-----TAPFFPRFLEALSYYSAIFESLDIT-----
-----LA-----RES-KERVNVEQQCLARDIVNI IACEGIDRV-ER-HEMM-GKWRARLTMAGFRPYPL
SQTV-NNTIKTLL--ESY-----SD--KYRLK---EE--GGALFLGWKNRPLIVSSAWH-----

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-----AALGYKVRSSDMADVAQKLEQLEMAMGM---GGACPTAD---

-----DG
FVSHLATDTV-----HYNPSDLSSWVESMLSELNAPPPLPPA-----

-----TPAPRLASTSSTVTSGAAAG---AGYFD-LPP
AVDSSSSTYALKPIPSVAAASA-----DP-SPDSAREP-----
--KRMRTGGGSTSSSS-----SSSSMDG-G-----RTRSSVVEAAPPATQ--
-AANGPAVPVVV-----VDTQEAGIRLV-HALLACAEAVQQENFSAADALVKQIP
VLASSQGA-MRKVAAYFGEALARRVYRLRPAPD-----GSLLDAA--FADLLH
AHFYE-----SCPYLKFAHFTANQAILEAFAGCRRVHVDFGIK-QG--M----QWPALL
QALA-LRP----GGP----P-SFRLTG VGGPPQP--DETDALQQVGWKL AQFAHTIRVDFQYRGLVA-ATL
ADL-EP-----FML-----RPEGGGDTDDEPEVI AVNSVCELHRL- AQPGT---LDKVLGTVR
A-VRPRIVTVVEQEAN--HN-----SGTFLDRFTESLHYSTMFDSLEGAGSGSGSGSGSG
QPTDASP-----PAG-TDQV-MSEVYLGRQICNIVACEGAERT-ER-HETL-VQWRGRLGGSGFEPVHL

GSNA-YKQASTLL--ALFAG-----GD--GYRVE---EK--DGCLTLGWHTRPLIATSAWRVAAP-----

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-----LPPRRRHVTGDLSDVTAAAASG-GGAPPPQ--SAAASAQLPALPTQL---HL--P-AFQV
QHSHHHHHHA-EVDAP-----PAGEVAA---STTAWVDGIIRDIIGS----SGGAGVSVA
QLIHNVREII-----HPCNPGLASLLELRLRSLN-----

-----AA
DPAAPLHQPLPHP-----PALP-PVPALPPPPPPQLTVTDKRRH-----E-----PQ
QAGEPTNPSPPQEEPK-----PP-----TAEETAAAAAAAAAAAA
AAAKERKEEQRR-----KQRDEEGLHLL-TLLLQCAESVNADNLDDAHQTLLEIA
ELATPFGTS-TQRVAAYFAEAMSARLVSSCL-----GLYAPLPPAS-PA----AARLHGR--VAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFAFEREERVHIIDLDM-QG--L----QWPGLF
HILA-SRP----GGP----P-RVRLTGLGASME-----ALQATGKRLSDFADTLGLPFEFC-AVA-EKA
GNV-DP-----EKL-----GVT-----RREAVAVHWLH--HSLY-DVTGS---DSNTLWLIQ
R-LAPKVVMTMVEQDLS--H-----SGSFLARFVEAIHYYSALFDSLDS-----
-----YG-----EDS-PERHVVEQQLSREIRNVLAVGGPAR--TG-DVKF-GSWREKLAQSGFRSASL
AGSA-AAQASLLL--GMF-P-----SD--GYTLV---EE--NGALKLGWKDLCLLTASAWRPIQTP-CR

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-----MCSRMGTVNCPDTS-----SVKLQ-QQQGPTSPT-----
-----ASFSESNIVAS-----STDPDAIDALAGLQALRFD-----
GDI-DGEIQSPDLAMWESLFADQIGAS--GADFLMS-SPRRDFSP-----LRDFMVS-----
-----SPKRDMV-----SSPKRDYMM-SSPKR-DYMMSSPKRDYMVSSPKREMGVSSPR
RSTFSNLYSS-----TINQA-----NQSYMHSMEG-----SPQMZY-SNLASHG----NKGK
SSPSPLHKVYINNINAHSNS--KSNPSSLSCSSSY-THG--ENLPLPSMDP-FLE----EYKEGYL
---AYQLPEKA-----GGSESAGTT----APISSQ-LPTLSECLAMPEPGY----GGDVEAA
AAMVGR-GIQVGGGLQPPDHLYYAGQFGAAE-----ESLS-----
-----SLQHMAKP-----EQW--ADS-S-----SLHSMLGS-----
-----VIQSEAHQ-----QQDQDQSGLQLV-HLLACADDFVSKGDQASALRHLHLR
RVASPLGDS-MQRVASYFADALAARLSLT-----CPSAVVSPGGAPFPFPSPD--TLKIYQ
I-LYQ-----ACPYIKFAHFTANQAI FEAFOGDDRHHVVDLDIL-QG--Y----QWPAFL
QALA-ARP----GGP----P-TLRLTGVGHPAA-----AVRETGRHLASLAASLRVPFEFHAAVA-DKL
ERL-RP-----ATL-----QRR-----VGEALAVNAVNRHRVP---GAH---LAPLLSMIR
D-QAPKIMTLVEQEAG--HN-----GPYFLGRFLEALHYYSALFDSLDT-----
-----FP-----ADS-APRMKVEQCLLAPEIRNVVACEGAERV-AR-HERL-DRWRRIMEGRGFEAVPL
SPAA-VGQSQVLL--GLYGA-----GD--GYRLN---ED--KGCLLLGWQDRAIIGASAWRC-----

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NAQHPYHP-----YQSSPDTHVVPQHDYSLK----SHSP-DAGFENQVTH-----

-----MKYTLDSSAAVGCMRH-----DSPSSHSFTPRSD-----SGSPL--SQEDSHS-
DST--NGS--PVSASCVTVT-EDPNDLRQKLDLE-AVMLG---PDSEAVNSLESSIA--NQLS-----

-----LEPEKWV-----QMMRFPRDNLK-ELLVACARAVEEKNSYAIDMMIPELR
KMVSVSGEP-IQRLGAYMVEGLVARLASSGH-----SIYKALK-----CKEPKSSD--LLSYMH
F-LYE-----ACPYFKFGYMSANGAIAEAVKGEDRIHIIDFHIS-QG--A----QWISLL
QALA-ARP----GGP----P-TVKITGIDDSVSAYARDGGLDIVGRRLSHIAGLCKVPFEFH-AVA-ICG
DEV-EE-----GHL-----GVI-----PGEALAVNFTLELHHISDETSTANHRDRILRLVK
S-LSPNVLTLVEQESN--TN-----TAPFVQRFAETLDYYTAIFESIDLT-----
-----LP-----RDD-KERINMEQHCLAREIVNLVACEGSEV-ER-HEVF-GKWKARLMMAGFRPSPL
SSLV-NDTIRALL--QSY-----SV--NYQLA---ER--DGVLYLGWKNRPLVSSAWH-----

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-----MY-KLNIFC-----
-----VYSPLIHHHKPL---VTSHHNR--IFNAFQ
V-YNS-----ISPLVKFSHFTSNQAI FQALDGEERVHIIDLDIM-QG--L---QWPGLF
QILA-SRP---LKL---R-SLRITGLGSSLE-----LLEATGRRLSDFAAALGLPFEFQ-PVE-GKI
GDQSKAGGGG--GAF-A-----PRD-----GREVAVVHWMH--HCLY-DVTGS---DEAAVSVIK
NVIRPRLVTVVEQDLG-RH-----GGDFLGRFVEALHYYSVAFDALGEG-----
-----AAAEGRSEEEE-AERHDVERQLLGAEIRNIVAVGGPKR--TG-EVAV-GRWGEEMRRAGFEQVSL
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QLFTNLPEFL-----SPCNLHLKGLIGCRLQLLLGGAGYPSKNFPPPGPNRS-GKRTR-----EVQ
VEWTNSKTFQNESQDL-----
-----HETLPRHHVRPENFISQKKVA--ASLSRVDLRC
P-----KPLKRSIDNLQLSLEPADERNLRHLHIGLQATQKDQSSHQVRHSRAQSTEPVQ-QHYHKLHTH
NVQDKADGFLQRSPAP-----SSASQFST-L-----NTMGSEDPPSQPKLPQ
TTAQNAQRED-----TVAPDEGLQLM-SLLLQCAEAI SADDNNQATAILPQLS
ELATPFGTS-VQRVVAYFAESMGSRLVTSSL-----GICRPLPCK-----QPASNQS--IVSAMQ
V-FNE-----ICPFVKFSHFTANQAI AEFEGKFNVHIIDVDIM-QG--L---QWPSLF
QVLA-SRA----GGP----P-HVHITGLGTSAE-----SLDATGKRLKDFAGSFGISFEFT-AIA-DKM
SNV-DI-----STL-----KVA-----FSDALAVHWMH--HSLY-DVTGS---DLDTLSLIQ
K-LNPKVITLVEQDFR--H-----SGTFLSRFLEALHYYSAMFDSL GAT-----

-----CK-----DDS-PERYMVEQQLLSCEIKNIVAFDGPGR--KI-NHKF-DQWRDELSKAGFKPVSL
SGKA-SHQAALLL-QSLF-P-----CD--GYTLL---EH--SGSLKLGWKDLYLFTASAWTRV-----

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ILLQENIQVGADPLYA-----TSRHNMQHALREIE-TVLMA---PDTDDATTSTKHEFEEIKPAQLVRQR
SRTWSHESRQ-----
-----PLPGVGRSQFASGGYPT
ASYEFRPEKRQR-----ELREDPQIIIVK-QLLTRCAEALSEDRTEEFHKLIVQEAR
GVVVSINGEP-IQRLGAYLLEGLVARHGNSGT-----NIYRALK-----CREPESKE--LLSYMR
I-LYN-----ICPYFKFGYMAANGAIAEALRTENNIHIIDFQIA-QG--T----QWITLI
QALA-ARP----GGP----P-RVRITGIDDPVSEYARGEGLDIVGKMLKSMSEEFKIPLEFT-PLS-VYA
TQV-TK-----EML-----EIR-----PGEALSVNFTLQLHHTPDESVDVNNPRDGLLRMVK
G-LSPKVTTLVEQESH--TN-----TTPFLMRFGETMEYYSAMFESIDAN-----
-----LP-----RDN-KERISVEQHCLAKDIVNIIACEGKDRV-ER-HELL-GKWKSRRLTMAGFRPYPL
SSYV-NSVIRKLL--ACY-----SD--KYTLD---EK--DGAMLLGWRSRKLISASAWH-----

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-----NKYTLDSSEGAGCMRH-----DSPSSQSFTTR-----SGSPL--SQEDSHS-
DST--DGS--PVGASC--VT-EDPNDLKQKLDLE-AVMLG---PDSEIVNSLENSVA--NQLS-----
-----LEPEKWV-----RMMGIPRGNLK-ELLIACARAVEEKNSFAIDMMIPELR
KIVSVSGEP-LERLGAYMVEGLVARLASSGI-----SIYKALK-----CKEPKSSD--LLSYMH
F-LYE-----ACPYFKFGYMSANGAIAEAVKGEDRIHIIDFHIS-QG--A----QWISLL
QALA-ARP----GGP----P-TVRITGIDDSVSAYARGGLELVGRRLSHIASLCKVPFEFH-PLA- ISG
SKV-EA-----AHL-----GVI-----PGEALAVNFTLELHHIPDESSTANHRDRLLRMVK
S-LSPKVTTLVEMESN--TN-----TAPFPQRFETLDYYTAIFESIDLT-----
-----LP-----RDD-RERINMEQHCLAREIVNLIACEGEERA-ER-YEPF-GKWKARLTMAGFRPSPL
SSLV-NATIRTL--QSY-----SD--NYKLA---ER--DGALYLGWKSRLVSSAWH-----

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PPPLSSQ----DHVLIHYIHQLDEQE-----AATMVRKRPAAPDMD-----
-----LPPRRHVTDGLSDVTA AAAAG-GGPGAPS----SASAQLPALPTQL---HQLPP-AFQ-
-----HHAAEVDVP-----PQPHPPAHSQAGGEAPA---STTAWVDGIIRDIIGS----SGGAVSIT

QLIHNVREII-----HPCNPGLASLLELRLRSL-----

-----AA
DP-APL-----PQQQRALL---H---GAPAAA-AGLALPLPPP---LPDKRRH-----E---PAPRC
QQQQQEEHPAPQSPK-----VP-----TAEET-----AAASA
AAAKERKEVQRR-----KQRDEEGLHLL-TLLLQCAEAVNADNLDDAHQTLLEIA
ELATPFGTS-TQRVAAYFAEAM SARVVSSCL-----GLYAPLPPGS-PA----AARLHGR--VAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFEREERVHIIIDL DIM-QG--L----QWPGLF
HILA-SRP---GGP---P-RVRLTGLGASME-----ALEATGKRLSDFADTLGLPFEFC-AVD-EKV
GNV-DP-----QKL-----GVT-----RREAVAVHWLH--HSLY-DVTGS---DSNTLRLIQ
R-LAPKVVMTMVEQDLS--Q-----SGSFLARFVD AIHYYSALFDSL DAS-----
-----YG-----EDS-PERHVVEQQLLAREIRNVLAVGGPARAGAG-GARF-GSWREELARSGFRAASL
AGGA-AAQASLLL--GMF-P-----SD--GYTLV---EE--K GALRLGWKDLCLLTASAWRPVQTPPCR

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-----LPPRRHV TGDLS DVTAAAASG-GGAPPPQ--SAAASAQLPALPTQL---HL--P-AFQV
QH HHHHHHAEVDAP-----PAGEVAA---STTAWVDGIIRDIIGS----SGGAXVSVA
QLIHNVREII-----HPCNPGLASLLELRLRSLN-----

-----AA
DPAAPLHQPLPHP-----PALP-PVPALPPPPPPQLTVTDKRRH-----E-----PQ
QXGEPTNPS PQQEEPK-----PP-----TAEETAAAAAAAAAAAA
AAAKERKEEQRR-----KQRDEEGLHLL-TLLLQCAEXVNADNLDDAHQTLLEIA
ELATPFGTS-TQRVAAYFAEAM SARLVSSCL-----GLYAPLPPAS-PA----AARLHGR--VAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFEREERVHIIIDL DIM-QG--L----QWPGLF
HILA-SRP---GGP---P-RVRLTGLGASME-----ALQATGKRLSDFADTLGLPFEFC-AVA-EKA
GNV-DP-----EKL-----GVT-----RREAVAVHWLH--HSLY-DVTGS---DSNTLWLIQ
R-LAPKVVMTMVEQDLS--H-----SGSFLARFVEAIHYYSALFDSL DAS-----
-----YG-----EDS-PERHVVEQQLSREIRNVLAVGGPAR--TG-DVKF-GSWREKLAQSGFRSASL
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HNPRLP RRGGGGGAA-----AAGGGASSSTAAAQGPFAES-----AA
AGHPSSLLYSASSGGGALDAPILVQHGGNPTQFLPSLPPPAPAVCGFSGLP LFP AEL-----
-----ERGGGGGAAAANEGV-----AGRGGADEGAASAWVDGIIRDL LSS-----AAPAVSIP
QLIHNVREVI-----HPCNPALAAVLEHRLRSLA-----

-----SS
DPLPPPPPPPLPSL-----
-----PSD-----APSLTSSP-P-----RARSPAPAPTGPASSQ
VATK-----PTTAAAAAQL-AGGARCAESVAADNLDEANRLLEIS
ELATPFGSS-AQRVAAYFSEAM SARLVSSCL-----GLYAPLPASS-PA----ALRVHHR--LAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFDREERVHIIIDL DIM-QG--L----QWPGLF
HILA-SRP---GGP---P-RVRLTGLGASLD-----ALEATGKRLSDFADTLGLPFEFH-PVA-DKV
GNL-DP-----DRL-----GVS-----RREALAVHWLH--HSLY-DVTGS---DTNTLWLLQ

R-LAPKVVTMVEQDLS--P-----GGSFLLARFVEAIHYYSALFDSLGLAS-----
-----YG-----EDS-PERHVVEQQLLSREIRNVLAVGGPAR--SG-DVKF-GNWREKLAQSGFRSVSL
AGNA-AAQATLLL--GMF-P-----SD--GYTLV---EE--NGALKLWGDLCLLTASAWRPIQTANPP
R-----

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-----LPPPRRHVTGDLSDVTAAG--SGGAPPS-----SASAQLPALPTQL---HQLPP-AFQ-
-----HHAAEVGVVPAPPPPPNPAHAQAGGEEAAA----STTAWVDGIIRDIIGS----SGGAAVSIT
QLIHNVREII-----HPCNPGLASLLELRLRSL-----

-----AA
DP-APLPPPPPPQPSQQHALL--HGVGAPAAA-AGLTLPPPPP---LQDKRRH-----EPPPPPPPP
QQQQQEEPHPASQSPK-----AP-----TAEETAAAAAAAAAAAA
AAAKERKEEQRR-----KQRDEEGLHLL-TLLLQCAEAVNADNLDDAHQTLEIA
ELATPFGTS-TQRVAAYFAEAMSARLVSSCL-----GLYAPLPPGT-PA----AARLHGR--VAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFEREERVHIIDLDM-QG--L----QWPGFLF
HILA-SRP----GGP----P-RVRLTGLGASME-----ALEATGKRLSDFADTLGLPFEFC-AVA-EKA
GNV-DP-----EKL-----GVT-----RREAVAVHWLH--HSLY-DVTGS---DSNTLWLIQ
R-LAPKVVTMVEQDLS--H-----SGSFLLARFVEAIHYYSALFDSLGLAS-----
-----YG-----EDS-PERHVVEQQLLSREIRNVLAVGGPAR--TG-DVKF-GSWREKLAQSGFRAASL
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-----SPKRDMV-S-----SSPKRDYMM-SSPMR-DLMASSPKREYMVSSPRRD--SSSSR
RSPFSPNLF-----TSGGG-----HQHGYYA--HGPTDGGVGGAGQPLY-GGLANHH----GK GK
SQ-SPLHKGYINN-----SGNKQSTGPSSLSCSSSY-GHA----DNDLPSMDTCFLD-----DYKGGY
IGYQQMPGKQQAAPGIMVNNNGCSTAVTTVGVAPSPSSHQ-LPTLSECLAMPEPAF----VGEEAAA
G-----GLQMG-VGLPSDLYAGQFAGGGGGGLTTTSS-----
-----SLQHMAKS-----DHQWAAAE-S-----SLHSMGLS-----
-----VIQTEAD-----EQEQDSGLQLV-HLLACADVFVSKGDQPSALRHLHLLR
RVASPLGDS-MQRVASYFADALAARLS-SNNPSS-----SAGAGAGAGVAPYTFPPSPD--TLKVYQ
I-LYQ-----ACPYIKFAHFTANQAIFEAFHGEDRVHVVDLDIL-QG--Y----QWPAFL
QALA-ARP----GGP----P-TLRLTGVGHPAA-----AVRETGRHLASLAASLRVPFEFHAAVA-DRL
ERL-RP-----AAL-----HRR-----VGEALAVNAVNRHLRVP---AVH---LGPLLSMIR
D-QAPKIMTLVEQEAG--HN-----GPYFLGRFLEALHYYSALFDSLGLAT-----
-----FP-----ADS-AQRMKVEQCLLAPEIRNVVACEGAERV-AR-HERL-DRWRRIMEGRGFEPVPL
SPAA-VAQSQVLL--GLYGA-----GD--GYRLT---ED--RGCLLLGWQDRATIAASAWRC-----

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-----MVH-----

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DSSNFSTTLQ-----QVEQDDIANWVDCMGLPEFEECGRPLEEVLKSDIDFN-----
--TTDIDFGFEMTSLEHCSAVAHEHDFSVSLLSDFLGP-----
-----DENLLLPESEFHYAKRLQELDDS--LSSMLNEVRS
SGSDSESSI-----
-----PTTAELVRL-----VEAQSCED-L-----GRQRACGAR-NHHHSRA
GSLGSTSEPQTL-----QQPENSGLQLV-HLLLACAEAIKSHFHKANPILDQLG
RFSNAYGGP-MQRIALYFGNALS NHLA-----GVVSP-----TDPHSPSD--SKFAYQ
A-FYK-----ILPFAKFSHVTANQTIYEAVLRSQNVHVVDLDIQ-QG--L----QWPCFI
QSLA-MRP----GGA----P-HLRISAVGMNME-----SLQTTKRWLTEFAEDLKVPFEFT-PVL-STL
ENL-TP-----AML-----NIR-----AEDDLAINCSQVLHTLS-GDEAV---LEKLLCMFR
N-LRPNVVTLLAEAN--YN-----AASFITRFIEALHYICALFDSLEGA-----
-----LG-----RDS-ADRFHIESTAFAAEINDILASKDSSRR-VR-HVRS-ETWRALFKKAGFRSMAF
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I-LWENTQVRPDHLYT----TSRHNMQHALRKIE-TVLMA---PDADDAATSTKHEFEHKPAPLMRQR
SRTWSHELRO-----
-----PSPGVVRTQFAS-GYPT
ASYEFRPEKRQR-----ELREDPQSMVK-QLLTKCAEALSEERIEEFLKLVQQAR
GVV SITGEP-IQRLGAYLLEGLVARHGNSGT-----NIYRALK-----CREPESNE--LLSYMK
I-LYN-----ICPYFKFGYMAANGAIAEALRNEDKIHIVDFQIA-QG--T----QWITLI
QALA-ARP----GGP----P-HVRITGIDDPVSEYARGEGLDLVGKMLKSMSEEFRIPLLEFT-PLPGVYA
TQV-TK-----EML-----DIR-----PGEALAVNFTLQLHHTPDESVDVNNPRDGLLRMVK
G-LSPKVTTLVEQESH--TN-----TTPFLMRFSETMDYYSAMFESIDAN-----
-----LP-----RDS-KERINVEQHCLAKDIVNIIACEGKDRV-ER-HELL-GKWKSRMTMAGFKPYPL
SSYV-NSVIRKLL--ACY-----SD--KYTLE---EK--DGAMLLGWKSRKLI SASAWH-----
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-----QFQLQEKMGTRQLDLPCGFAKRENHPRVLS-----
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SSL-----VAKIEPTDQ GALWEESSRRLKRFHERDCFEE-SILARAKRTRTGEAG
QLVGGGGGGGGGDEDIWFPE SIERTPFV-----E
EEKVFLVP-----SAASFPVDNTSLVGSFESE---KDFEWPNTK
SQSDS-----SSSSGT-----
-----GGLSPKPEI-----ETE-----NRNDVVAYT
VGGAGVDES-----TRIESEGLG LL-NLLTSCVEAIGAGNHEAVNYLLARLG
EQASPKGTP-IHRVVAYFTEAVALRVAKLWP-----HIFSITSPRELTD----HLEDEEN--DAIALR
L-LNH-----VSPIPKFLHFTCNERLLRAFEGKERVHIVDFDIK-QG--L----QWPSLF
QSLA-SRP----QPP----A-HVRITGVGECRQ-----ELLNTGVRLSRFAEALNLPFEFH-AVT-DRL
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EDV-RL-----WML-----HVK-----RDECVAVNCVLMHKLLYDETGSA--LMDFLGLIR
S-VKPEVVLTAEQEAD--HN-----DERWELRLGKSVQYYSVAFDSDLDC-----
-----LA-----SDSPAARAKIEQ-MFAREIRNLVACEGDERF-ER-HERF-SKWIKKMEDGGYRSAGI
GERE-IVQSQLIL--RMYA-----SD--KYSVEKRGEGV-SEGLSLRWVDQPLYTVSAWALSEVGGSS
STSLPC-----
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-----SPKRDYMM-----SSPKRDYMV-SSPKR-DYMMSSPKREYMTSPRRD---SSPR
RSTFSNLYSG-----TGS-----HQQGYVDGVHGAEGGSGSGGGQPLY-GGLANH-----GKGK
SQ-SPLHKVYINN--AHSNGG--RSTGPSSLSCSSSY-GHG---ESLSLPSMDP-FLD-----EYKEGGG
YLAGYQLPVKT-----GMENGAASAATVTTVAPSPSQ---LPTLSECLAMPEPVY---GGSEAAAA
G-----GLQMG-AGLPAELYGGQFGGDF-----
-----TLQHQMAKS-----DQW--AGD-S-----SLHSMLGS-----
----VIQTEA-----EQEQDSSLQLV-HLLLACADVFVSKGDQPSALRHLHLLR
RVASPLGDS-MQRVASYFADALAARLSLSSNPSSSSSSSSGAATPRGGAAAGVAPYTFPPSPE--TLKIYQ
I-LYQ-----ACPYIKFAHFTANQAI FEA FAGEDRVHVVDLDIL-QG--Y----QWPAFL
QALA-ARP----GGP----P-TLRLTGVGHPAA-----AVRETGRHLASLAASLRVPFEFHAAAA-DRL
ERL-RP-----AAL-----QRR-----VGEALAVNAVNRHLHRVP---SAH---LGPLLSMIR
D-QAPKIMTLVEQEAG--HN-----GPYFLGRFLEALHYYS AIFDSL DAT-----
-----FP-----ADS-APRMKVEQCLLAPEIRNVVACEGAERV-AR-HERL-DRWRRLMEGRGFEPVPL
SPAA-IGQSQVLL--GLYGA-----SD--GYRLT---ED--KGCLLLGWQDRAIIAASAWQC-----
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EEEE-----AAAETRGLRLL-SLLLRCAEAVAMDQLPEARDLLPEIA
ELASPGSS-PERVAAYFGDALCARVLSSYL-----GAYSPLA--LRPL----AAQSR--ISGAFQ
A-YNA-----LSPLVKFSHFTANQAI FQALDGEDRVHVIDLDIM-QG--L----QWPGLF
HILA-SRP----TKP----R-SLRITGLGASLD-----VLEATGRRLADFAASLGLPFEFR-PIE-GKI
GHVADA-----AALLG-----PRH-----HGEATVVHWMH--HCLY-DVTGS---DAGTVRLK
S-LRPKLITIVEQDLG--H-----SGDFLGRFVEALHYYSALFDALGDG-----
-----AGA--AEAEA-AERHAVERQLLGAEIRNIVAVGGPKR--TG-EVRV-ERWGDELRRAGFRPVTL
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GISNLSDETV-----HYNPSDLSGWVESMLSDDLDPTRIQE-----
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---KPDSEYDLRAIPGSA-VYPR-----DEHVTRRSKRT-----
-----RIESELS-----STR-----
-----SVVV-----LDSQETGVRLV-HALLACAEAVQQNNLKLADALVKHVG
LLASSQAGA-MRKVATYFAEGLARRIYRIYPRDD-----VALSS--FSDTLQ
IHFYE-----SCPYLKFAHFTANQAILEVFATAEKVHVIDLGLN-HG--L----QWPALI
QALA-LRP----NGP----P-DFRLTGIGYSLT-----DIQEVGWKLGQLASTIGVNFEFKSIAL-NNL
SDL-KP-----EML-----DIR-----PGLESVAVNSVFELHRLI-AHPGS---IDKFLSTIK
S-IRPDIMTVVEQEAN--HN-----GTVFLDRFTESLHYSSSLFDSLEGP-----
-----PS-QDRV-MSEFLGRQIILNLVACEGEDRV-ER-HETL-NQWRNRFGLGGFKPVS I
GSNA-YKQASMLL--ALYAG-----AD--GYNVE---EN--EGCLLLGWQTRPLIATSAWRINRVE---
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-----GVAVPQHQLSHFQQMPQTLQD TDNVRWDY-----
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-----PNS
LSPQSPFDIQ-----DHNSNFSTRMLQSKVGSYNHSYSSLRPSTIP-----
-----PQSHLQFSTISPQLVEPVQSLQSQTL SGNKRDF-----
QGSSFQVQNKQPTRSAGRNIYSEVV TSTSPVGOENLVTVSHHQSFSGNNYNISHGQP--STWPTAPTGC
KVGE-----LATELQPEILGDLRPGPGYLADHYPGRLL
QSGQAYNQNLGPQG-----NPNDLPSG-S-----GTLSSSLQQNFPGDDGM
IRVLDTACSRRN-----QQT SATGLQLV-HLLLLCAEAI SNQQMDLAHVVLTRLN
AMLVPCTST-MQRLAAVFVDALHARITNSATT-----GRYKGLER-----DNDVAILD--MLQSFS
V-IYD-----HTPFIKLPHLTLNQIILD AVEGEPHVHVIDLNTGWRG--M----QWPGFI
QALA-LRP----GGP----P-KLRITAI GKAD-----DLEHSREKLQDYARHLQVPFEFC-PLV-VDM
KSF-DV-----RLL-----DMR-----DWEVVCINSANQFHQLLIWGDEC---FHKFLCDLK
S-LNPRVLAFTENDAD--HN-----SPKFLNRFFECLRYYSAVYDALDSS-----
-----LP-----NGS-AALQQVEHLFTGQKIRNIVAMEGEDRI-TR-HESL-TSWSRRMEMAGFRPVPV
SSRA-ISQAGLLL--RMYFA-----QS--GYTLR---TE--NGNVSLGWDNMSLVGASAWRA-----
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-----MADTPTSRMV-HPFGDVPRQTPKQFLYSG
NSQHLCYP-----YQSASDTHVVPQRHCTMR---SHSP-DAGSEDHDNH-----
-----KQYTL DSSATSGCSRH-----DSPSSQSVHAG-----SGSPV--SLED SHS-
GSTNGNGS--PVSASC--VT-EDPTDLKQKLDLE-AAMLG---TDPEIVNSLEISIA--DQLS-----
-----
----LEPEEWK-----HMMSMPGGNLK-ELLIACARAVEYNNSYAIDLMIPELR
KKVSVSGEP-LERLGAYMVEGLVARLAASGS-----SIYKALK-----CKEPRSSD--LLSYMH
F-LYE-----ACPYFKFGYMSANGAIAEAVKGEDRIHIIDFHIA-QG--A----QWISLL
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QALA-ARP----GGP----P-FVRITGIDDSVSAYARGGGLELVGRRLSHIAGLYKVPFQFD-AVA-ISS
SEV-EE-----GHL-----GIV-----PGEAVAVNFTLELHHIPDETSTANHRDRILRLVK
G-LSPKVLTLVEQESN--TN-----TAPFAQRFAETLDYYTAIFESIDLA-----
-----LP-----RDD-RERINIEQHCLAREIVNLVACEGEERV-ER-HEVF-GKWKARLMMAGFRPSPL
SALV-NATIKTLL--QSY-----SP--DYKLA---ER--DGVLYLGWKNRPLIVSSAWH-----

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-----MCSRMGTLNCSDTTS-----SVKLQ-QQQGPTSPT-----
-----ASFSESNIIVAS-----STDPDAIDALAGLQALRFD-----
GDI-DGEIQSPDLAMWESLFADQIGAS--GADFLMS-SPRRDFSP-----LRDFMVS-----
-----SPKRDMV-----SSPKRDYMM-SSPKR-DYMMSSPKRDYMVSSPKREMGVSSPR
RSTFSNLYSS-----TINQA-----NQOSYMHGMEG-----SPQTQY-SNLASQG----NKGK
SSPSPLHKVYINNVAHSNSG--KSNPSSLSCSSSY-AHG---ENLPLPSMDP-FLE-----EYKEGYL
---AYQLPEKA-----GGSESARTT-----APTSSQ-LPTLSECLAMPEPGY----GDGDDDTA
AAIVARAGIQVGGGLQQTDLHYLYASQFGAAE-----GSLs-----
-----SLQHQMAKP-----EQW--ADS-S-----SLHSMLGS-----
----VIQSEADQ-----QQEQDSGLQLV-HLLLACADLVSKGDQPSALRHLHLLR
RVASPLGDS-MQRVASYFADALAARLALA-----CPSSVVSPGGAPFPFPSPD--TLKIYQ
I-LYQ-----ACPYIKFAHFTANQAI FEAFOGEDRVHVVDLDIL-QG--Y----QWPAFL
QALA-ARP----GGP----P-TLRLTGVGHPAA-----AVRETGRHLASLAASLRVPFEFHAAVA-DKL
ERL-RP-----AAL-----QRR-----VGEALAVNAVNRHRVP---GAH---LAPLLSMIR
D-QAPKIMTLVEQEAG--HN-----GPYFLGRFLEALHYYS AIFDSL DAT-----
-----FP-----ADS-APRMKVEQCLLAPEIRNVVACEGAERV-AR-HERL-DRWRRIMEGRGF EAVPL
SPAA-VGQSQVLL--GLYGA-----GD--GYRLN---ED--KGCLLLGWQDRAIIGASAWRC-----

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-----MANTPTSRMM-HPFGSVPRQNLKQFQYSD
NAQHTCHP-----YQSSPDTHVVPQHDIYSLK---SHSP-DAGFENQVTH-----
-----MKYTLDSAEVGC MRH-----DSPSSHSFTPRSD-----SSSPL--SQEDSHS-
DST--NGS--PVSASCVTVT-EDPNHLRQKLDLE-AVMLG---PDSEVVNSLESSIA--NQLS-----

----LEPEKWV-----QMMRFPRDNLK-ELLVACARAVEEKNGYAIDMMIPELR
KMVSVS GEP-LQRLGAYMVEGLVARLASSGH-----SIYKALK-----CKEPKSSD--LLSYMH
F-LYE-----ACPYFKFGYMSANGAIAEAVKGEDRIHIIDFHIS-QG--A----QWISLL
QALA-ARP----GGP----P-TVKITGIDDSVSAYARDGGLDIVGRRLSHIAGLCKVPFEFH-AVA- ISG
DEV-EE-----RHL-----GVI-----PGEALAVNFTLELHHISDETSTANHRDRILRLVK
S-LSPNVTLTLVEQESN--TN-----TAPFVQRFAETLDYYTAIFESIDLT-----
-----LP-----RDD-KERINMEQHCLAREIVNLVACEGSE RV-ER-HEVF-GKWKARLMMAGFRPSPL
SSLV-NDTIRTLL--QSY-----SV--NYQLA---ER--DGVLYLGWKNRPLIVSSAWH-----

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-----MLAGCSSSLLSP-----RHRLRSEASAQFQAC-----

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-----KPIEAKNSTCSLKQNI RLPSS  
TSAQTSYVEG-----RRESKD-----EFWEKGRSLKRYAEQGCIDDESCMS-RAKRKKSNRKSGDSS  
EDGYDLSLSQLGGGDFWLQSGFNAARSVPLIAGLHPPQAAPFSFSCSG-----E  
EESVCYVP-----NEVISPPPLMSNNPWIESVTE--ITNFGDKNVS  
TSQDLAR-----EASVSSASLDS-----  
-----HGLVLRPNE-----NLGEHEVG-N-----GSRLPNPNDRGEVVTAH  
NGHN-----NHREDDAAELI-SLLVSCVEAIGSRNVTGVNQLIARLG  
QLASPRGSP-VSRLTAYFTEALALRVARIWP-----HIFHIIPPRDL-----DRLDDD--SSTALR  
L-LNQ-----VSPIPKFIHFTSNEILLRAFEGKDRVHIIDFDIK-QG--L----QWPSLF  
QSLA-SRP----NPP----T-HVRITGIGESKQ-----DLVETGDRLAEFAEALNLAFEFH-PVV-DRL  
EDV-RL-----WML-----HVK-----EGESVAVNCVLQMHRLLYDSSGGI--LRDFLGLIR  
S-TNPTIILMAEQEAE--HN-----EPSLEARLVNSLRYAAVFDIAFG-----  
-----LP-----LDS-PARIKIEE-LFARDIRNIIACEGRDRT-ER-HECF-GKWRKLMEQGGFRCTGI  
TERE-LLQSQMLL--KMYS-----CE--DYRVTKQGND--DAALTL SWLDQPLCTVSAWTPIDAAGSS  
SSYYQPS-----  
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-----AALGYKVRASDMADVAQKLEQLEMAMGMGGV-GAGAAPD---  
-----  
-----DG  
FAAHLATDTV-----HYNPSDLSSWVESMLSELNAPPPPLPPA-----  
-----  
-----PQAPRLSCNSSTVTG---G---GGYFD-LPP  
SVDSSSSTYALKPIPSPV-VTPA-----EP-SADPAREP-----  
--KRMRTGGGSTSSSS-----SSSSSLGG-G-----GTMSVVEAAPP-----  
-AANAPALPVVV-----VDTQEAGIRLV-HALLACAEAVQQENLSAAEALVKQIP  
LLAASQGA-MRKVAAYFGEALARRVFRFRPQPD-----SLLDAA--FADLLH  
AHFYE-----SCPYLKFAHFTANQAILEAFAGCRRVHVVDVDFGIK-QG--M---QWPALL  
QALA-LRP---GGP---P-SFRLTGVPQP--DETDALQVGVKLAQFAHTIRVDFQYRGLVA-ATL  
ADL-EP-----FML-----QPEGEEDPNEEPEVIAVNSVFEMHRL-L-SQGA---LEKVLGTVR  
A-VRPRIVTVVEQEAN--HN-----SGSFLDRFTESLHYSTMFDSLEGAGSGQS-----  
EISPGAA-----AGA-TDQV-MSEVYLGRQICNVVACEGPRT-ER-HETL-GQWRGRLGQAGFETVHL  
GSNA-YKQASTLL--ALFAG-----GD--GYKVE---EK--DGCLTLGWHTRPLIATSAWRMAAP-----  
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-----MLQGVLSRAPATDAAA--AAAMK-AKRSAASPG---  
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-----  
-----  
-----EEE-----EGDGRSARGG-----KRQQLLALGPATALASA  
VAAE-----EGPETRGLRLL-SLLLRCAEAVAMDQLTEARELLPEIA  
ELASPFSS-PERVAAYFGDALCARVLSSYL-----GAYSPLA--LRQL---AAQSR--VAFAFQ
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A-YNA-----LSPLVKFSHFTANQAILQALDGEDCLHVIDLDIM-QG--L----QWPGLF
HILA-SRP----RKP----R-SLRITGLGASLD-----VLEATGRRLADFAASLGLPFEFH-PIE-GKI
GHVADA-----AALLGSRQHQN--QQR-----DDEATVVHWMH--HCLY-DVTGS---DVGTVRLLR
S-LRPKLITIVEQDLG--H-----SGDFLGRFVEALHYYSALFDALGDG-----
-----AGA---AEEES-AERYAVERQLLGAEIRNIVAVGGPKR--TG-EVRV-ERWGDELRRAGFRPVSL
AGSP-ATQARLLL--GMY-P-----WK--GYTLV---EE--DACLRLGWKDLSSLTASAWEPADDAAS
APTTTS-----

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PPPPSSP----NHFLLHYLHQLDHQE-A-----AAAAMVRKRPASDMD-----
-----LPPRRRHVTGDLSDVTA AAAAGVGGSGAPS----SASAQLPALPTQL---HQLPP-AFQ-
-----HHAPEVDVPA-----HPAPAAHAQAGGEATA---STTAWVDGIIRDIIGS----SGGAAVSIT
QLIHNVREII-----HPCNPGLASLLELRLRSL-----

-----AA
DP-APL-PPPPQP-QQHALL--H--GAPAAAPAGLTLPPPPP----LPDKRRH-----E---HPPPC
QQQQQEEHPAPQSPK-----AP-----TAEETAAAAAAAQAAAA
AAAKERKEEQRR-----KQRDEEGLHLL-TLLQCAEAVNADNLDDAHQTLLEIA
ELATPFGTS-TQRVAAYFAEAMSARLVSSCL-----GLYAPLPPGS-PA----AARLHGR--VAAAFQ
V-FNG-----ISPFVKFSHFTANQAIQEAFEREERVHIIDLIDIM-QG--L----QWPGLF
HILA-SRP----GGP----P-RVRLTGLGASME-----ALEATGKRLSDFADTLGLPFEFC-AVA-EKA
GNV-DP-----EKL-----GVT-----RREAVAVHWLH--HSLY-DVTGS---DSNTLWLIQ
R-LAPKVVMTMVEQDLS--H-----SGSFLARFVEAIHYYSALFDSLDS-----
-----YG-----EDS-PERHVVEQQLSREIRNVLAVGGPAR--TG-DVKF-GSWREKLAQSGFRAASL
AGSA-AAQASLLL--GMF-P-----SD--GYTLV---EE--NGALKLGWKDLCLLTASAWRPIQVPPCR

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NPQHLCHP-----YQSAPDTHVVLQRRYTVRSQ--SHSPNAGSEDHETH-----
-----KQYTLSSAASGCSRH-----GSPSSQSVHAG-----SGSPV--SHDDSHS-
GSTNGHGS--PVSASC--VTGEDPTDLKQKLDLE-AVMLGTSETDPEIVNSLEISAA--NQLS-----

-----LEPEEWE-----HMVSMPRGNLK-ELLIACARAVERNNSYAIDLMITELR
KMVSVSSEP-LERLGAYMVEGLVARLAASGS-----SIYKALK-----CKEPRSSD--LLSYMH
F-LYE-----ACPYFKFGYMSANGAIAEAIKGEDRIHIIDFHIA-QG--A----QWVSL
QALA-ARP----GGP----P-FVRVTGIDDSVSAYARGGLELVGRRLTHIAGLYKVPFQFD-AVA-ISG
SEV-EE-----EHL-----GVV-----PGEAVAVNFTLELHHIPDETSTANHRDRILRLVK
G-LSPKVLTLVEQESN--TN-----TAPFAQRFAETLDYYTAIFESIDLA-----
-----LP-----RDD-RERINIEQHCLAREIVNLVACEGEERV-ER-HEVF-GKWKARLMMAGFSPSPL
SALV-NATIKTLL--QSY-----SP--DYKLA---ER--DGVLYLGWKNRPLIVSSAWH-----

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-----AVLGYKVRSEEMADVAQKLEQLEVMMSNVQ-----  
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-----ED  
DLSQLATETV-----HYNPAELYTWLDSMLTDLNPP-----  
-----  
-----SSNAEYDLKAI PGDA-ILNQFAIDSASSSNQGGGDTYTTNKRLKCSNG-----  
-----VVETTTATAE-----STR-----  
-----HVVL-----VDSQENGVRLV-HALLACAEAVQKENLTVAEALVKQIG  
FLAVSQIGA-MRKVATYFAEALARRIYRLSPSQS-----PIDHS--LSDTLQ  
MHFYE-----TCPYLKFAHFTANQAI LEAFQGGKRVHVIDFSMS-QG--L----QWPALM  
QALA-LRP----GGP----P-VFRLTGIGPPAP--DNFDYLHEVGCKLAHLAEAIHVEFEYRGFVA-NTL  
ADL-DA-----SML-----ELR-----PSEIESVAVNSVFELHKLL-GRPGA---IDKVLGVVN  
Q- IKPEIFTVVEQESN--HN-----SIFLDRFTESLHYYSTLFDSLEGV-----  
-----PSG-QDKV-MSEVYLGKQICNVVACDGPDRV-ER-HETL-SQWRNRFSGAGFAAAHI  
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-----MAATHVVSCKRS-----PTIFSEVATATCKRW-----  
-----KSEAAWHHVEEMAPEPPPIQDFDLKVKTSCLK-----  
-----MVQ-----  
-----PEPTSVLDLQ-----ASPGRSCSSSTSLSSGT-----DSPHSIST  
DSPNFSTTVQ-----QVEPVDIASWVDCMALPEFEDCDRHLEEVLSKSDIDFA-----  
--STDLDFGFELTSLDHCSVVTEHGYSVLLSEFLGDP-----  
-----DENLLLPEFHDARLQELDDS--LSSMLSEVRS  
SGSDSGSSV-----  
-----PTTVELARL-----VESLPCSD-L-----RRHGGVDTKHHHHHSRS  
ESWGSTSKLQTL-----QHPEDSGLQLV-HMLLACAEAEIEKSDFNKAKPILDQLL  
RSSDPYGDPMQRIALYFGEALTDHLA-----GVVSP-----SETHLLSD--SKLAYQ  
A-FYK-----VLPFAKFSHVTANQTIYEAVVRSQNVHVVDLDIQ-LG--L----QWPCFI  
QSLA-MRP----GGA----P-HLRISAIGTNAE-----NLQTTKRRLSEFAEALKVPFEFT-PVL-SSL  
ENL-TA-----AML-----DIR-----SEEDLAINCSQVLHTLS-GEEAV---LDKLLSMFH  
N-LKPNVVTLLAEAN--HN-----GASFIARFVEALHYICALFDSLEGA-----  
-----LG-----RDS-ADRYHIESTALAAEIKEIVAFKGNRRR-VR-HVRS-ETWRGLFAKAGFLSMAF  
SSYT-VQQAQMLL--EVLTSKPMQANATMPYKLS---QE--STSLILGWQETPVIGVSAWTC-----
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-----MADPPTSRMVQHHPFGDIPSQTPKQFLYSG  
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-----SRQYTLDSSSASGCSGH-----GSPSCQSVHAG-----SRSPVSHSHDDSHS-  
GSTNGNGS--PASASC--VT-EDPTDLKQKLDLE-AVMLGT-DTDPETVDSLEIAIA--DRLS-----  
-----  
-----VEPEEWKN-----NMVSVPRGDLK-ELLIACARAVEQNGYSIDLMPVELR
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KMVSVSSEP-LERLGAYMVEGLVARLAASGS-----SIYKALR-----CKEPRSSD--LLSYMH
F-LYE-----ACPYFKFGYMSANGAIAEAVKGEDRIHIIDFHIA-QG--A----QWSLL
QALA-ARP----GGP----P-FVRVTGIDDPVSAYARGGGLVGVKRLSHIAGLYKVPFQFD-AVA- ISG
SEV-EE-----GHL-----GVV-----PGEAVAVNFTLELHHIPDETSTANHRDRVLRVVK
G-LSPRVTLTVEQESN--TN-----TAPFAQRFAETLDYYAAIFESIDLA-----
-----LP-----RGD-RERINIEQHCLAREIVNLVACEGEERV-ER-HEVF-GKWKARLMMAGFRPSPL
SALV-NATIKTLL--QSY-----SP--DYKLA---ER--EGVLYLGWKNRPLIVSSAWH-----

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LLDGHYTATV-----TATATDLSEFMDQLIRPNPSLS-----

-----QNTDDFSID-----NTPSNN-----NYVAQSDVHTPPQKAPR
RDCYERSGDEGG-----E---RPHHDHEMRMI-TLLMECAVQISTENLGEAQNMLLELT
QMASPYAASCAERVVAYFAEAMASRIVNSCI-----GVCSP-----LLPYKT--ILSAFQ
A-FNN-----LSPFIKFGHFTANQTILEAFHQEERIHIIDLDIM-QG--L----QWPALF
HILA-TRP----NGP----P-QVRMTGLGSPGP-----VLEETGMQLAGFARRLGMRFEFH-PIA-RRS
GDL-DP-----SSVIIPP-----GRR-----SGEAVAVHLMR--HALY-DATGD--ESNTMRLL
H-LGPRVVTLEQEMG--HN-----CGPFLGRFVFGALHYFSTVFDLSS-----
-----WA-----VDD-VGRHRVESGLLAREIANVVAVGGPGR--GG-EEKV-GRWRDELARRGFVQVEM
SGNA-MAQAQLIV--NMFPP-----AL--GYSVLH--GS--DGSLLGLGWKAGLYTASAWTARSSL--

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QTYLGISSWLELNQHWRLGDATKFFKVAEHEGQNSMSSAV-----DSKRLDSGKSGNQHS-----
-----TALAMSKEPTSVLDLPSSCSVSLSSQHSMSVSDGISK-----

-----LQTVADQLLSDEQDSAHPMQ
SATPETS NML-----MDQ--DVMTWMSLTRGSDHSASDMDPVPDWFHKQPER-LDLNAQQYYCSKTGL
DFHKNPMTMERICNNLPSSHHHYVAQPFKLI SQAQLTMSETAGNQQTGFFD-----
-----TSTSSNQRAFQQCRNVKAQGAT--LMSMIDGTGA
ITGSQLLNSTVVPTPELWKLLSSQ-----HDASPQCGNQG-----
-----PPNKQAPIT-----QARDQQR-S-----TSLAIPTQQPQPQLPYH
FGQTLYPGVT-----PQDQETGIH MV-HLLACAEAVDMCQSATAGPMLARLR
SIYDPEGEP-MRRIALYFAEALFERLTIEMNRKQSSHHGSCVRFPEPEVD---SAASPSLE--CDIAYQ
A-YYQ-----ILPFKKFTHLTANQALLEGVANYPRVHIIDFNIR-QG--L----QWPSFI
QSLA-MLP----RGP----P-QLKFTAVQTDAA-----TVQKTGNRLAEFARTMHVPEFVY-ILE-ESV
ESF-HQ-----GMI-----SPR-----AEEALAVNCS DMLHRLR-RKEGK---LTEL LGKIR
S-LQPVVVTVLEVDAN--HN-----EPSFMPRFVHALHYCAVFD SLEAA-----
-----LL-----RNS-LDRLRIENHCFSTQIRSI IALEDV DRE-IR-HVRA-ETWQSHFLQAGFRAVTV
SRYA-ADQAQLLL--GLYKP-----SDRMPFTLS---SG--FGGLSLGWRET P VAVSSWTFSPPY--

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