

>GloPP01

M-----A
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RTDTRGIRVPPIEEEIMPYWYFPSEVITQASRKV-----KNAK-SKSERIVIPYT--FS
GNQLDPEFRVAYFREDLLVNSHHWHHLVYPFTWLP-EM----GGT-KDRKGELFYMH
QQMLARYDAERLSNNLARVKPLSDIRSPIQEGYSSRLMSTLTGTFYPTRAANSKLSDVI-
-EISLARIQLWKDRLLLEAIHTGEAL--GSDG---KKVKLIDP-----EGIDILGA
MVESAAISVNQKYYGILHNFGHVILSRIHDPDGRFGGDMGVMGFTQAAMRDPV FYRWHKE
IDNMFDEYKLNQKSYTTQDLT--WPDVVVSNVSVKA EKA-----
-----QKANFLQTFWQEREVFLSRGINFVSEN-PV
VVSIRHLQHEDFSWNVEVDNTTGKEQEAMVRILIAPKYDEFQARYQFSDLRRIFIEMDKF
YAKLKPGKQTI-TRRSSSSNVTISTPQSFEVLANL--PPDA--PPKAEDAIC---GCGW
PDHMLLPKGRPEGMSFILFAMVSDFNKDKVQSS-----RTT--LC--DDAAS
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VVTPA-----TIF-----

>ClePP01

M-----AAATNRQ
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RADTRNLSIPPTEEIMPHWYFPSTVITQADVAV-----KAAA-TEERIVIPYE--FA
HNERDPEFRVAYFREDISLNSHHWHHLAYPYVWLP-SQ----GGI-KDRKGELFYMH
QQVLARFDAERLCNSLNRVTPLNDFRKALDLGYFPNLISTNSGILYPGRPANMIPADLN-
-DISIDRMELWKDRILEAIHTRSVI--DRNN---KQTTLED P-----AGIDILGA
IIESAALS VNRTFYGDFHNFHVIIGQIHDPDGKYGTDSGVMGFSSTAMRDPIFYRWHKA
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-----KKTNFIQTYWQEREILLSRNIDFGRAN-PV
VVRARHLQHESFVYELEVDNQ TGGPQEGVLRLFLAPLLDELNDPLPLSELRR LFIELDKF
EVKLNAGRQVI-SRKSEDSNVTLTAARGFEQLATA--GEPT--PEGNDGFC---GCGW
PEHLLVPKGRPEGSR YTLFAMITDWSQDKVVSP-----KPTTK--TC--RDAAS
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VYQPT-----PVF-----

>EtaPP01

M-----ATVTQKQY
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RKETRDLP LPPIIHEVIPYWYFPSEVFTRALREV-----RDSQ-DPQETIIVDYR--FA
GTEIDPEHKLAYFREDIDINSHHWHHLVYPFTWAP-RD-----NEI-KDRKGELFYMH
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-DISVQQMQMAKHRILEAIDNGYAI--NREG---QRVDLRDP-----KGS DLLGD
IVEAATISVNPRYYGDW HNRGHR IIMRIHDPDTRYGGDRGVMGFPSTAMRDPIFYRWHKE
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LVQTRYLNHEPFLYNI A IHNRTDADIKATVRIFIAPQFSEFRREFTYAELRR LFMELDKF
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>PlaPP0

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RPD TTDLP LPPIQEIIPYWYFPSEVFTRALRRV-----RDAQ-NDQEEIVLDHP--FA
GNELDPERRLAYFREDVDVNSHHWHHLVYPFTWVP-QQ----GEV-KDRKGELFYMH
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-DVSLQRIEQAKSRIQEAIHRGYAI--DRQA---KQVPLRDP-----KGIDTLGD
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 -----TSPNLLRTFWQEKRVPLSRGVDFGRPN-PV
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 PNHMLLPKGKPEGMKFILFAMLTOWNQDKVNGA-----TKQ--KC--CDPTS
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 >MguPP01
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 KPQLRGINLPPIEEVLPQKFVPSDIVSRAVNQE-----RRTPAESTEPILNVD--FT
 GNDLDIEHRLAYWREDVGLNTHHWHWHIVYPFTWEA-SL-----GGM-KDRKGELFYMH
 QQMIARYDCERLSHNLSRVVSYHNFDEPIPEGYAPHLSKDISGTVYASRPANMIMRDL-
 -SITVNRMRIWYNRIIDAIHRGNYI--QSDR--TRVPFDAA-----TGIDKLGD
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 -----QRPNNLQTFWEDRQFDLQRGINFNRPT-PV
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 RSVLF-----PIN-----
 >TjaPP01
 M-----TDRQLLQ
 QTVLDLFEHVTEPVDRRPPF---QASIP--GIVPDAKDLADTGVR LG--PLMTGIGILP
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 KPQLQGVNLPPIEEVL P QKFVPSEIVTQAVNEE-----RRTPAETTDPIILSVD--FT
 GNDLDIEHRLAYWREDVGLNTHHWHWHIVYPFTWEP-SL-----GGM-KDRKGELFYMH
 QQMIARYDCERLSHNLSRVTSFHNFTAPIQEGYAPHLSKDISGTVYASRPNMVLDLP-
 -SMTVQRLRTWYNRIIDSIHGSYL--QPDG--TRVPFEEV-----TGIDRLGD
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 M-----SDVDLQ
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 GNDHDIEHRLAYWREDIALNAHWHWHIVYPYTWTS-EM-----GGT-KDRKGELFYMH
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 -AVPVHRLKTWYNRIINSIHGEFYR--QTDG--KLLPFDEA-----TGVDKLGD
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GSILF-----PSE-----T

>SmaPP0

M-----TTMNPQ
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QPELRNIRLPPIEEVLPMKFVPGPLITDARNT-----RRMPADATEPIVLSLD--FT
GNDRDIEHRLAYWREDIALNTHHWHWHIVYPFTWTP-DL-----GGT-KDRKGELFYMH
QQMIARYDCERMSHNLSRVVYHNFDDPIDEGYAPHLNNDISGTVYASRPVNMVLQDTP-
-SVPVHRLITWYNRIVNSIHERTYR--RSDG---QVVPLDET-----NGISIIGD
IVEPAATGPSPTYYGDFHNSGHDLSRIHDPDERFREEMGVMGDSATAMRDPVFYRWHKF
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-----SRPNNLQTFWQDRTFELQRGINFNRSI-PV
RLQTRHLQHEAFTYNIVIQNGSSSAVEGMIRLFMAPSNNEIQQPFTLEDQRHIFIELDKF
TATLNPNGNNTV-TRQSSQSNVTVATQKSFSQLIQE--SQDGT--TEEQISSC---SCGL
PDHLLIPRGKPEGMEFQLFVMVTNAQQDRVVP-----TTT--TC--QDAAS
YCGILNERYPDVRPMGFPPDRRIEAA--TLDVF--R--TTNMNMAPVNIRFRNVVGTND
SSVLF-----PNE-----R

>LfoPP01

M-----ARPGMQ
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KPEMRMVRLPPIQEILPEKFFPADIIISARNME-----RRQS-EPQTPLVIGLD--FT
GNDLDIEHRLAYWREDINLNAHWHWHIVYPITWIP-EM-----GGV-KDRKGELFYMH
QQMIARYDAERLSHNLRVESFDNWSDPMQEGYAPHLSKETSGTVYASRPVNMVLKDL-
-DVTITRLQTWYERILDSIHGRFIL--LPDG---TRERLDEI-----TGIDKIGD
IVEASLLSPNPDYYGDFHNNGHVDVISRVHDPDGRFREEMGVMGDTATAMRDPFYRWHKF
IDLLYQEYKRTLTPYS-THLI--WNDINIEEIKVQGRLS-----
-----QQVNALQTFWEDSEIRLDRGLNFNSPT-AV
SVMVRHLQHEAFQYTLDIENRTSTPHSGTVRIFLAPRLNELQEPFPLNDQRHLMEMDKF
EVSLKPGKNII-HRNSADSNVTLSNIKTFSQLIEE--VTES---SEEQSYC---GCGL
PDHLLLPGKPEGMSFQLFVMVTNSNEDRVTGG-----SGQ--KC--QDAAS
YCGILNEKYPDSKPMGFPPDRNIEAA--NLADF--K--TSNMSFTDVIIRFRNEVLDTNG
STVFF-----PGA-----

>SwePP01

M-----SASPPWQ
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RTDSRGITFPPIEEVLPAKFFPSEILSRARNED-----RRLT-DTTTTITIDMD--FT
GNDLDIEHRLAYWREDIGLNAHWHWHVYPFFWTP-EM-----GGL-KDRKGELFYMH
QQMLARYDTERLCHNLSRVETLHNWVDPIPEGYAPHLKSKEISGTIYASRPANMTLQDIP-
-QIQLHRLRTFYNRRIIESIHVGSIL--LPNG---QRQPLTEQ-----TGIDVLGA
IVEPSSQSPHPNYYGDFHNNGHVDVIARIHDPDGRFNEEMGVMGDTSTAMRDPVFYRWHRF
IDDLYQEHKRTLNPYTRQQLT--WSAVAVRSVSVQGKIS-----
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AISMKPGANTL-QRVSTQSNVTVATVRSFSDLIND--ANQPG--AGEAVSSC---SCGL
PDHLLLPRGKPEGMAFQLFVMITNAAEDKVEGS-----SGR--RC--MDAAS
YCGVLNEKYPDRKPMGYPPDRRIQAP--DIETF--L--TPNMGIQEITIRFRNIVSDPTG
TRVLM-----PDT-----

>SdePP01

M-----AEVKSMQ
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RGRIFSTFNDRDHMDEAMRVVRLML---DDRDLQLALAYLRDINEELFVYSISVLSTS
QPTLRRTKLPPVEEVLPAKFIPSSAISQARTIQ-----RRASQETQETIIIDVD--FT

GNDLDPEHRLAYWREDIGLNAHHWHWHIVPYTWIP-EL-----GTI-KDRKGELFYMH
QQIARYDCERISLNFPRVRPLLNWTEPMAEGYAPHSKEISGTVYAFRANMTMRDL-
-FITVDRLRTWYQRIIQDIHKSFT--RDDG---TKVQLDND-----QGIDIVGD
VVEAAYTTPNATFYGDFHNLGHQIIARVHDPDERYKEEVGMADSTTAMRDPIFYRWHKF
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SVRYRHLQHESTWNIEVENKSNADKPGTVRIFMAPTFNDTRQRFSPNDQRLMLEMDKF
EFNFKPGKNII-QQRSEQSNITITLRSFGELIAE--SESDD--LLDAQSYC----SCGL
PEHLLVPRGKQEGMPFQTFVMITDAVKDRVNGD-----SK--QC--HDATS
YCGVINEKYPDKKPMGPFDRVILAA--DWSTF--K--TSNMNFGDVTVTTFKEEVINANA
GSLVF-----PK-----

>SbaPP01

-----LFDNVHEPLEERKSF---QAAFAS-GPIIRSRDAAATGERLR--PQMNGIGILP
RGKIFSTFSKDHMEAMRVIRLLMRL---ESRDLQLALAYLRDNVNEELFVYATSVLFTH
QPNFRGIRLPPVEEVLPKAFIPSDVISARVIQ-----RRATESTETPIIIDVD--FT
GNDLDPEHRLAYWREDIGLNAHHWHWHIVPWTWTP-DM-----GTI-KDRKGELFYH
QQMIARYDCERMSLNFVRVPLQNWNEPMAEGYAPHLTKEISGTVYAFRANMRLRDM-
-HITVDRLRTWYNRIVQDIHKGFT--ASDK--KKVPLDND-----KGIDIVGD
VVEATYNGVNPTFYGDLHNLGHWTIARVHDPDERYKEEVGMADSTTAMRDPIFYRWHKF
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-----QRPNMIGTFWQDRTLNLERGVAFNPSV-PV
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PDHLLVPRGKAEGMPFQTFVMITNALEDVREGG-----TE--KC--RDATS
YCGVLNELYPDKKPMGPFDRVIHET--DWSLF--K--TPNMAFGDVSIQFREQVNAS
GNLMF-----PE-----

>SdePP02

M-----EDQLNLQ
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NPDLK-IKLPLIEEVLPQKFGTGDVIRKAVKEN-----E--KAMSMIPIIIDVE--YT
STPLEPEHALAYWREDIGLNAHHWHWHIVPYEW-P-DG----NKP-KDRRGELFYMH
QQMIARYDCERLAVDLPRVPLHDWDFIPEGYAPHLNKEIANTYCYRPSNMILN-----
-QVNIDELRQMYETIIQDLRSGFFI--RNDD---AKIPLDTE-----RGIDIVGN
TVEASNASANMDRYGSLHNNGHNAIARIHDPGRFKLEDGVMADTATAMRDPIFYRWHKF
IDNIFLQHKSRTPYTREELM--FEKVIIDSIYIQGKTS-----
-----KATDKIETFWQESKLNLENGINFKNKV-SV
SVRYRHLQHEKFEWNIEVENKWNENEQGTVRIFMAPIYGEDGKELSPNEQRLMIEMDKF
EYTLRPGTNYI-SRRSDQSNVTIQTLKRFSELDKE--TK-----VTNEASC----SCGL
PDHLLVPRGKKDGMFQTFVMITSAIEDRVKG-----KGQ--HC--LDAAS
YCGVINDKYPDKKPMGPFDRVINAA--DWSSF--K--TPNMGFGVIKICFEDIVKSDL
HDE-----NDH-----

>HanPP01

M-----EEGY
RRILTMLRHSATDITYTF-----PAPLSG-----AGVIDRVIPAIPNLGRLQ
RGRSFSTFNRSHMQEAMQIVRAFTGL--ENLDECTDLASTLRSRINEELFVYCMYSTVLH
RPDTRNAMMPPIEEILPYKFVDNRVIKRAWRTL-----ESRQPDQLEPIEIPYN--FS
GNDLDPEHRLAYFREDIGINSHHWHWHIVFPIEWRA-SD-----GGL-KDRKGELFYMH
QQIMARYDAERFSLHMARTRPLQNWTLVPVEGYSPHLTSELGQYANRPSFMTMEDVPG
DSITLDRLQTFRNRRIIHAHTGTII--DSNG---ETRRLDEQ-----TGIDVLGD
MIEASSLSPNMQFYGDFHNLGHIVLARMHDPDRRFLETNGVMGFSETAIRDVPVFFRWHRF
IDDI FVDYKETLTPYTTEQLN--WSGVSIQGVTIQNGT-----
-----NAGTANQLETFWQERVLTLSVGVNFTRDV-PV
TVKLTHLQHEEYDLVLDVDNSADSVVTATVRVFLAPTLDEASARLPLNQMRRLFIELDKF

QTTVEPGRQTI-QRRSMDSNVTIPSPQSFGDLLNL--ALP---STVEQSSC---SCGW
PHHMLLPRGRPEGMNFTLFVMTNGIEDQVEQV-----SSER--RC--ADATS
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NSRLVRLEDLGGTVPSTGTTPLEGPVWP

>SdePP03

M-----EKTRQMQ
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HPDFKTVHLPPYQEIFPDKFIHKETISKIKRQV-----IHNGKDSKKEIVIPAD--FS
GDNLDPEHRLAYWREDIQLNSHHWNWHLVYPTDWTP-DS---GEGL-RDRKGELFYMH
QQLVARYNCSRLSVHYPRVTAFFEWDEPIVEGYNSHLLKENSIGINYGRPGNMILQDLP-
-NLTKSILRAWYQRIMQSIHLGYLT--SREYN--THIPLNNE-----GGIDKIGA
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-----KQNNQLQTFWEESTLDMKYGLAFECGS-PI
VVRYRHLQHEQFNWSIIIVENISNEKKQGMVRIFMAPKYDVTGNQFTPNELRKLMIEMDKF
EFTFEAKKTVIVTRKSRDSSVIIPDAKTTQNIREE--LQK---DDPWQHYC---GCGL
PSHLLVPRGKREGMFMFTVMITDATKDKVYEE-----DDD--VC--KTAPS
YCGILNKKYPDKRAMGFPPDRQISDN--SWQKF--Q--KPNMSVENLNSDLLVIVNRAVK
NSL-----AIL-----

>CcrPP01

M-NL-----AKLTSVCVLGLSV-----FLL-C-GS-AVAHKGIQ
KHITGYLYRLTVPSD TDGPLSNSSGPPFAG-SSTNSTTEFVDIEVRYPDNLTLCPGPKLP
RGRVFSAYQRDHMRQVEDITIFIMKI--NNETEVIIEVLGFLRNKVNEQLFLYVVSVLVLV
HPQMAGINLPLIQDVLNPKFITCEMISEVRQDILVNVSGTKERQ-AEPQVMVLDQD--FT
GSNINPEHRVAYWREDIGLSAHHWHWHVVFSDFLPISA-----DQT-RDRKGELFYFMH
AQLLARHNSERLASRLARIMPLKDWSQLRIPEGYDHLGNEISGVVYAPRPADMLMKDVP
-QIQLNEMQWTYDHIVDTIDRQQFL--RRSGNNFQTVSLNDE-----SGIDTLGN
MLESNAMSPDLTYGDLHNMGHVLSRIQDPTGAFKTEMGAMGDLVTAMRDPVFYRWHLF
IDDLVYVRHKRTLPTYSDRMFN--FQDVDISSVVVTGDVT-----
-----KTPNKLVTYQWSEQLNLAHGLDFRRRN-SV
TVRFQHLQHENFKYTTITVNNKLVNTLGMVRIFWVPTLNEAGEPFDLEDQRRFFIEMDRF
PATFTPGNNVI--TRLSSSAVILPSRASFAQPNSF--DEL---GSIGNSYC---TCGL
AEHLLVPRGTEAGMQFQMFVMISNGTADRVVDLP-----PDSKA--SC--KAGVT
LCGILNRKYPDSKPMAFPDRPFRRGGQSSISEF--AQGRSNMFLTDMTGTGSG-----
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>HauHcB2

M-RS-----LIVFCGLLALAIA-----AEN-C-GE-KTDVEAKQ
AKVKEVIQYINRPHIHSGG-----SCD-----AE-ASHLTA--ASLKEIGHLD
TNSVFSLFDERTWPEAKEAVRLMMKA--ANFDEFITIAIDLSSHMMNDMFLFCFNVAIVH
RDDTSGVRPEFHNSFPDKYIRHDQIVEIRHAV-----ECGQ---DNIKVLANP--HV
FNDTDDAHKLLYWLEDLGLNAHHYHWHVHPAIWTE-EL-----GRG-KERRGELFYWMH
QQMIARYDAERLSNDMAPTSVFENFDEPIEEGYASDLTVEHTGYRYMFRPEGLTLHDLP-
-ELTKNQLRLWRIRILNAINKGYAY--DKEG--HKVPLNNK-----DGINIISN
FVESSVDSINRPFYGNIHNYAHVIASRIADPDGKYGEDNGVMYDVSTSARDPLFYSHHKF
INSLFIEHKDMLPAYTHDDLE--FKDVVVDITISVKGKEE-----
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DVEHRYLDHEEFERYRLDITNNAADKHAIIRLYLAPLHHNDGTEYTLTEKRTAVIELDTF
LTTLKPGSNHI--THDSTDSAVTYFHE-----KDQHHDC---PCGW
PQNLLLPSKNYQGMWRLFAVVDDADEEHSE-I-----GENC--NC--GSALS
YCGIVSGKYPNSKAMGYPPDRHIDAH--NVEDW--V--TPNIQHVDITIKFAGK-----
-----HA-----

>HauHcB1

M-RS-----LIVFCGLLAVAFA-----TEN-C-GE-KTDVEAKQ
AKVKEVIMHINRPHVHAGG-----SCE-----PP-PTKLSA--ESLKEIGHLD

TNSVFSLSFDERNWPEAKEALTMMKA--ATFEDFITVAKDLSHHMNDMMFLFVFNVAIVH
RDDTSGVRPEFHFKTFDPKYIRHDQIVEMRHAV-----ECGK---DNIKVLANP--HV
FNDDTDAHKLLYWLEDLGLNAHHYHWHVHPAIWTE-EL-----GRG-KERRGELFYWMH
QQMIARYDAERLSNDMAPTSVFENFDEPIEEGYASDLTVEHTGYRYMFRPEGLTLHDLP-
-ELTKNQLRLWRIRILNAINKGYAY--DKEG---HKVPLNNK-----DGINIISN
FVESSVDSINRPFYGNHNYAHVIASRIADPDGKYGEDNGVMYDVSTSARDPLFYSWHKF
INSLFIEHKDMLPEYTHDDLE--FKDVVVNTVAVKGKEE-----
-----TQENILTTFYKYRSFALPTGFTFNHEK-HV
EIEHRHLDHEEFYKLDITNNAATDKHAIIRLYLAPLHHNDGSELTLTEKRTAVIELDTF
LTTLKPGHNQV-THDSTDSAVTYFHE-----KDQHHDC---PCGW
PQNLLLPKSNYHGMEWRLFAVVDDADEEHSE-I-----GENC--NC--GSALS
YCGIVSGKYPNSKAMGYPFDRHISAH--SVEDW--V--TPNINYADITIKFTGK-----
-----HA-----

>HanHcB

M-RS-----LIVFCGLLALAVA-----SDN-C-GE-KADVEAKQ
AKVKEVIAHINRPLVHAGG-----SCE-----AHPTSHIDS--KTYKEIGRLD
GNSVFSLSFDERNWPEAKQAVTLMMKA--ETFDDFITVSNDSLHHMNEDMFLFCFNVAIVH
RDDTSGVRPEFHFNVYPDKYIRHHQIVQIRHEV-----ECGK---DNIKVLANP--HV
FNDDTDAHKLLYWLEDLGLNAHHYHWHVHPAIWTE-EL-----GRG-KERRGELFYWMH
QQMIARYDAERLSNDMTPNPVFENFDEPIEEGYASDLTVEHTGYRYMFRPEGMTLQDLP-
-ELTKNELRLWRIRILNAINRGFAF--DDEG---NKIELNNN-----DGINIISN
FVESSFDSINRKYGNHNYAHVIASRIADPDGTYGEDNGVMYDVATSARDPLFYSWHKF
INSLFIEHKDMLPSYTHDDLE--FKDVVVNTVAVKGKEE-----
-----TVENILTTFYKYRTVPLPTGFTFNKDK-HV
DVEYRHLDDHEEFYKLDITNNAEDKKAIIRLYLAPLHHNDGSLLTLAEKRTAVIELDTF
ITTLKPGHNQV-THDSTDSAVTYFHE-----KDQHHDC---PCGW
PQNLLLPKSNYHGMEWRLFAVVDDADEEHSE-I-----GENC--NC--GSALS
YCGIVSGKYPNSKPMGYPFDRYIDAH--SVEDW--V--TPNINYVDITIKFTGP-----
-----HA-----

>ScuHcB

M-RT-----LFVLCALVAIAV-----AEK-C-SAPSGDVAAMQ
AKIDEVVAPINRPFHPPGG-----DCHH-----VAPLDA--EKMKGIGLMS
HHEVFSLSFDERQWPEAVRVLKLLLEA--ESFDDFIATANSLSHNINEDMFFYCFTVAVNH
RKDCGGLRAPHIYKVYPDKFIRSTYINEIKQOI-----DCGK---DNIKVLVNP--HF
FNNTDSAQQLLYFLEDGGLNTHHFHWHAIHPAIWED-SL-----GRH-KDRRGELFYWMH
QQMIARYDAERLSNGLPPAPTFFENFDEPIEEGFAPDLTIDHTGYRYMFRPEHMLVRLDLP-
-ELTKNQLRLWRVRLNAIHAGHAH--HKNG---EEVQLLNE-----NGIDTLAK
FVESSAESINRPPYGNHNYAHVIASRIADPDGKFGEDNGAMYDVTTTSARDPLFYSWHKF
INSLFVEHKDMLPVYSKTELQ--WNDIVVKKVHVKGRET-----
-----GVEDELHTYWKTITAPIQKGFSTTRDK-NV
EIDVRYLDHEEFDYITDLTNNAAAPKAVVRIFMAPEHHLDGSMFTPNEMRLNIIQLDAF
TTELTPGANTI-VWKSEMSGVSYHHV-----QDKNDEC---ICGW
PHNLLLPRGNHEGLDFKLFVVVS--EGSIE-E-----EDTC--HC--KSALS
YCGAVYGKHPNSKALGYPFDRRIDDH--TIEEF--V--TSNMGMTDITIKYTGE-----
-----KH-----

>SmuHcA

M-RC-----FVLVLLIAATF-----ASQ-C-PEPPSDAAAKQ
QQIYQIVEYINKARTPEPI-----VEGVDE--SELKYLGHLP
KNEIFSLFDERNWPEAKAAVKYLLEP--KTFDDFIKAAKILITRINDEIFLYALSVAILH
RPDTRGVQVPRIQDVFPDKLIPKFLVQQIREAA-----IRGD---QNPIVYLN--VS
SNNLNVENRLGYFTNDLGMNSHHYHYHVHPATGVP-IQ-----TVI-KDRHGSRFAMH
SQIVRRYESERLSNSLPLTESFVNWDEPIQTGFSSHLSIFMKGYNYNFRPEKVRLSNLP-
-ELTKNMMRLWKSRLLYGIHKSALT--SANN---KNVSLERG-----DGEDLLGN
AIESSLLSINRVFYGNLHNYAHVIAGRASDPDGRYGAHNGVMHDVATSARDPLFYRWHKF
IESIFQQYREYLPYSHYKLT--YPAVVVEKVEVVPDKR-----

-----PDIVNVVRTGYTTNKLKLNPGDFTRQS-TA
TVNVQHLNHEPFHYKFRIHNKAQQVQNAAVRIFLAPKYDEQGHRLKVNDQRQLMIELDKF
VVHLQPGVNQF-ERSSSESVTMPTKYFFGDIQD-----IARNHSC---SCGW
PEYLLLPRGTYEGLKFQLFVAVTNWDEDKVKDK-----VEPEC--QC--SESLS
YCGTVSGKYPDSRPFPGYPFERPIVES--NWEDF--V--TQNIHISDVNIRFVGNA-----

>SdeHcA

M-RC-----FVLVLLIAATF-----ASQ-C-PKPPSDAEAKQ
QQIFQIVEYINKAQTPPEV-----VEGVEE--KELKYLGHLP
KNEIFSLFDERNWPEAKAAVKYLLEP--KTFDDFIKAAKILITRINDEIFLYALSVAILH
RPDTRGVQIPRIQDVFPDKFIPNLLQQIREEA-----IRGD---QNPIVNLN---IS
SNYLNVENSLNYFTNDLGMNSHHYHYHVHPATGVP-IQ-----TVT-RDRHGSRFAHMH
SQLVRRYESERLSSGLPLTESFVNWDEPIQTGFSSHLTIFKKSYYNFRPEGITLSDLP-
-ELTKNKMMLLWKHRILLGIHSQFLI--SANN---KNVSLERE-----DGEDLLGN
AVESSLLSINRQFYGNLHNYAHVIAGRASDPDGRYGAHNGVMHVDVATSARDPLFYRWHKF
IESLFQQLREHLKPYSHYELT--YPAVVVEKVEVVPDKH-----
-----PETVNKVRTGYTTNKLKLNPGDFTRQS-TA
TVNVQHLNHEPFHYKFRIYNNAAQQVQNAAVRIFLAPKYDEQGHRLKVNDQRQLMIELDKF
VVHLQPGVNQF-LRSSSESVTMPTKYFFGDVQD-----IARNHSC---NCGW
PEYLLLPRGSYEGLDQFLFVAVTNWDEDKVKDK-----VEPEC--QC--SESLS
YCGTISGKYPDRRPFPGYPFERPIVES--NWEDF--V--TQNIHISDVNIRFVGNVVEEEKQ
IE-----KHH-----

>NadHcA

M-KL-----LILVLALLGSTLAI-----C-PDAPGNVKSQQ
EQLQKIVDGVNR-YQPGGQ-----SG-----PANIDL--QKYALGHLD
QDDIFSLFDERNAEEVRQSIQYLIIEP--SSFDFGIQAATQLSHIVNDELFLYALSAVLR
RPDTAGVHVPHRIHDVFPDKFIPRDILQNIRESA-----ITKS---EQAEEYNNP--VT
RNYLNVEDRLNYFTDDLGLNSHHHHYHVLHPPTGFPQGS-----HSD-SDRHGEFFYWMH
HQFVARYEAERLSNGLPLTEPFENWDEEIHGTGYAPHLTVFKKGYNFRPEGLVLSDLPL-
-ELTKNKMRLWKSSLLYAIQVNQMI--AANG---SSVDIHNS-----HGIDVVTN
AVVSTNHTINRPLYGNLHNYAHVIASRVSDHDGRYGVEGGAIEDVVTSAARDPLFYQWHKF
IDEILQECHKDSLHPYSQYQLT--WSDIELKDASVPAAR-----
-----PDEPNVIHTYSSSRYQIRQGFDFTRDR-AA
TINVNHLNHEPFKYRLRIRNNAQEPRTAAVRIFLAPKYDEQGHREFVNEQRKLMIELDKY
VLTVPGEQNY-LRSSAVSSVTVPRSYIYDDVQK-----VPHTHRC---ACGW
PEYLLLPRGSYEGMEFELFVAVTDWNEDQARGN-----VQPEC--QC--SQAWS
YCGSLQGTYPDSRPLGYPFDRHVEES--SWEDY--L--PHNIQHRDVVIQFVGYNPHQE
-----NNQ-----

>SmuHcB

M-AA----LQWFLGLVALSLVA-----GEQ-C-PK-TNDIQEKQ
RRLVEALS FVNRPFPNPKSK-----DHDL-----TSAEKQ--FLDSHVGYP
RREVYSVFDARYLPEANASLYFLDA--PNFDGFIRAVDILSHRINEDMLYVVSVAAATH
RDDTRGVILPRIHDLYPDKVLTHDIIVQIKQKA-----LRND---KDIVVDGTK--QH
VDYRNPPYSRLHYFLNDIAMNSHHYHWHVQNSLIWNN-RTYPSVANLL-KERVGAFAFAYMH
HEMVNRFDAELLSNYLPRVTPFENWNDPIPEGYASHLTVDRYQYSYMFPSNLPLEDLS-
-DITRNEMRQWRDLILNAIHKGAI--TKDG--RNLTSEE-----DGIDIIGN
MVESTVNSINLPLYGNLHCYAHTIAARVADPDNTYGEDNGAMYDVATSARDPLFYRWHKF
IDNLIQEYRNSLSYTNELK--WSVVVVEGLTVEG-----
-----AKVNKIKTFWEDDVLTVGTGFSFTGPSATA
KVNVRHLQHEEFSYNIQVVNNAGENKKAVFRIFMAPKYDEKGYEYDFNEQRQSMFEMDKF
VKELTPGKNVV-VRKSSESVTQKHEKIYSNPKE-----RQQNDHC---SCGW
PDNLLVPRGSYEGTEFQFVVVVTNYEEDYVP-S-----DESC--HC--GDGRS
YCGILFGNHPDRRTYGPFDKRTNAH--TFPDF--K--TPNMNAVDVSIQFTGVIK----
-----KSS-----

>SdeHcB

M-AA---LQWFLGLVALSLVA-----GEK-C-PK-TNDIQEKQ
RRLVEALSYPNRPYNPKPK-----DHEL-----TPAEKK--FLESHVGYLP
RREVYSVFDARYLPEANASLYFLLDLP--PNFDGFIRAIDILSKHINEDMLYYVVSVAATH
RDDTRGVILPRIHDIYPDKFLRSEIIGQIKQKA-----LGNE---KDIVVDDTK--QH
VDYRDPYSRLGYFLNDIAMNSHHYHWHVQNSLIWKN-RTYPSVANLL-KERIGAAFAYMH
HEMVNRFDAELLSNKLPRVTPFENWNDPILEGYAAHLIVDRYQYNYMYRPPNLKLDLP-
-ETTRNQMRQWRDRILDSIHKGAI--SKDG---RNVTLSEE-----DGIDIIGN
MVESTVNSINLPLYGNLHCYAHTIAARVADPDNTYGEDNGAMYDVATSARDPLFYRWHKY
IDKIIQAYRNSLSYTVLEQLT--WPVVVVEGLTVEG-----
-----AKVNKIKTFWEDDVLTVGTGFTFTGPSATA
KVNVRHLEHEEFSYNIQVVNNAGENKKAVFRIFLAPKYDEKGHEFDNFNEQRQSMIELDKF
VTELTGPKNVV-IRKSSESVTQKHEKIYANPKE-----RQQNDHC---NCGW
PDNLLVPRGSYEGTEFQVFVVVTNYEEDYVP-S-----DESC--HC--GDGRS
YCGILFGNHPDRRPGYPFEKRTDAH--TFQDF--K--TPNMYAVDVSIQFTGVIK----
-----KSS-----

>SbaHcB

M-AA---SIWFLGLAAVSVIS-----AEK-C-PK-TSDIEAKQ
QRLVQVLSYVNRPNPLPK-----KHAL-----TPEEEN--LVRNHLGVLG
RREVFSVFDERYWPEANAYLQYLLAV--ESFDDFVQAVEVLGHSINEDMLYYVVSVAAVH
RDDTRGVVLPRIHDVYPDKFLPTEVIVQIRERV-----IKNE---KDIVVNATE--QH
YDYRDPYSRLRYFLEDVGMNSHHYHWHVQNSLLWKN-QKYPASAANTL-KDVSGAAFVHMH
QEMVNRFDAELLSVGMPRVTPYENWDEPIPEGFSSHLTVDRYQYRYMFRPANLILSDLP-
-EMTRNQMRQWRDRVLQAIHKGVI--TSYG---RNVSIHGE-----NGLEILGN
IVESTVNSVNRPLYGNLHSAHVIAARVADPDQRYGEDYGAMYDVTTTSARDPLFYRWHKY
MNNLFREHSNSLQPYSIQQLI--WSDVTVEGVTVEG-----
-----SKVNKIKTFWEDDVLTVGSGFSFTGQS-KA
TVKVRHLEHEEFTYNIQVTNGAESSKAVIRIYLAPKYDEQGHEFDNFEEQRQSVIELDKF
VYELTPGKNTV-SRKSSSESVVQKHERVYANPEQ-----RQQNDHC---SCGW
PDNLLVPRGSYEGTVFQVYVVVTSHEEDYVQ-S-----DESC--HC--GEGRS
YCGILLGANPDRRSFGYPFDRRTHAH--TFHEF--K--TQNMNVADISIQFTGTIK----
-----KSS-----

>AgrHcB

M-VG-----LAVLIGVVA-----GEK-C-PK-TSDIQTQK
KQLQEILSYVNRPYVTLISKQ----QHSL-----TPEEEV--YLRNHVGHLA
KREVYSVFDERYMEEANASLHYLLEP--QSYEGFVRAAEILRHHINEDMFYYVFLVAATH
RDDTRGVVLPRIHDVYPDKFLWTDVIVQIKQKA-----IRNE---QNIVVDATE--QP
YDYRDPYSRVRYFLEDLALNSHHFHWVQNSLLWKN-EPHSSAAGTP-KDRSGENFYWMH
HQMVNRLDAELLSMPSVTPYENWDDPIEEGYASHLTVDRNQYRYMFRPANLVKLDLP-
-EMTRNQMHQWTDRIILLAIHKGVI--TRDG---KNVTLRGD-----NGIDILAH
IVESSVNSVNRLLYGSVHTYAHVIAARIADPDQKYGEDYGAMYDVSTSARDPFFHRWHKK
VDNVLQQYKSSLRAYQPQQLT--WNDVVVEGVTVEG-----
-----SKVNKIKTYWEDEVVSVGSGFSFTGQS-TA
RVNVRHLQHEDFIYNFQITNAGSNKKAVFRVFLAPKYDETGHEDFNEQRRSVIELDKF
VHELTPGKNAV-TRKSSDSSVQKRGQVFVTPEQ-----RQQSDQC---SCGW
PAHLLVPKGSCGTVFQVYVVVTNYDEDYVE-S-----DQSC--HC--GEGRS
YCGVLLGENPDRRPLGYPFDRRTDAR--TFEEF--K--TQNMNIADVSIQFVGTVK----
-----KSG-----

>TspHcB

M-AI---QPVWFAAFAILSFA-----AEK-C-PQ-TSDIQTQK
QKLVEILSYVNRPYVKWNR-----KQPL-----NPQDEE--ILHGKVGLLN
QREVYSVFDERYWGEANASLYLLRP--QSFNDFVKA AEVLRQYVNEDLFHYVFLVATTH
REDTRGVVLPVRHDSYPDKFFKTDVITQIKAAA-----LLGR---KDIVVDDTE--ED
YDYRNPYSLLSYFLEDLGMNSHHYHWHVQNSLLWSN-RLQRGGAQTLQKDRYGEAFYWMH
HQMVNRFDAELLSNRLPRVTPYENWDDPIEEGYASHLTVDRHQYRYMYRPPGLVLRDLP-
-EMTRNQMRQWRDRVLVAIHKGVT--TRDG---RNVTLNDP-----EGIDILSH

LLESTVESINRPLYGNVHSYAHVIAARVADPDQRYGEDYGAMYDVTTTSARDPLFYRWHRY
VDNILQSYKNTLPHYTENDLL--WNDVKVESVTVEG-----
-----SKINKIKTYWEDETVTIGKGYSYTGDS-SA
SVKIRHLQHEEFNYNIQINNNAGSNRRRAVIRVYLAPKYNEKGHELSEEQRRSVIELDRF
SQELVPGKNTV-TRKSVESVTQSNEQIFADPQR-----RQQQDHC---SCGW
PNYLLVPRGSYEGTEFQVYVVVSNYDEDHVE-S-----DQSC--YC--GQGYS
YCGVLYGKYPDRRPFPGYFDRQSDAR--SFDEF--K--TQNMVATDVSIFTGNIK----
-----KSS-----

>NadHcB

F-YSP--TISWIFLAIIFTLAS-----AEQ-C-PR-TKDIDAKQ
GQLLDIIKYVNRPHYQLPQR---DQNL-----SPDEEK--KYRSHWGILE
QREVYSVFDERYIEEANASLHFLLEP--DSYDQFIRRAEILRHYINEDMFLYVLNVAVTH
RDDTRGVVLPRIHDVYPDKFLTDDVIVQIKEAV-----LRGE---KNIVVDDTA--HD
YDYRNPYSRLNYFLNDLALNSHHYHWHVQNSLLGN-RVIPSGPDTS-KDRTGEAFYWMH
HQMVMNRFDAELLSNHLPRTPPFENWDDPIEEGYAPHLTVDRYQYRYMFRPANLVLRDLP-
-EMTRNQMRQWRDRLNNAIHRGYVI--SSSG--ANVTLRDE-----NGIDILSH
LVEPNVDSVNPPLYGGLHSYAHVIAARVADADHKYGEDYGAMYDVVTSARDPLFYRWHKY
VDDVFQEQYKDSLHPYTEEERN--WNDVKVEEVTVEG-----
-----SKVNKIKTHLEEDIVHVGSGFSYSGDS-SA
KIKVRHLAHEDFKYNIQVTNNAGSAKRAIIRIYLAPKYDEQGEQIEFNEQCRTVIELDKF
AAELAPGKNTI-TRQSSSESVIQDHKNVYADPSS-----RQDDSDC---HCGW
PDYLLIPRGSSEGTEFQLYVVVSDYQKDGID-V-----DQSC--HC--GDGHS
YCSVLYGQNPDRRPHGYPFDRHTDAR--TFEQF--R--TPNMYQTDISIRYDNTVVK---
-----GSS-----

>ChoHcB

M-GH----LTWLLVICALAIGLAS-----SEK-C-TS-TGDIRAKQ
QKLTEIIQYINRPYNIQTP----KPQP-----TPEEEE--YFRQNVGYLD
EHEVFSVFDERYWKEANASLHYLLSA--NTYQDFVRAAEILRYVYVNDLFFHYVFLVAVTH
RDDTRGVNLPVHEVWPDKFWHRDISELKLA--IHSQ---KDIYVNDTE--IR
HDYRDPYSAVSYYLEDGLNSHHYHWHVQNSLLWDN-EDWPSVSKVH-KDRLGEAFYYMH
NQMVNRFDAELLSNHLPRVSPFENWDEPIEEGYASQLSIDSIQYHYTYRPPRIVLQDLP-
-EMTRNQLSQWRSQILQAIHHGKVV--RDDG--ETIYLTRN----QPGTDQGIDVLGH
LVESTVQSANRPLYGNIHSYAHVIAARVADPDSRYEAANGVMYDVTTTSARDPLFYRWHKY
VDDILQEYKNSLEPYSHEDLS--WNDVAVEQISVEG-----
-----SRVNKIKTYWEDESQVLQNGHTFTINT-TP
KIRTRHLAHEDFSYNLQVTNNAGGETKAIIRIYLSPKYDEQGEPLDFNDQRQSVIQLDKW
VQTLTPGKNII-TRKSVESVTQKHSDIYSHYTS-----QENDDHC---NCGW
PSNLLIPRGSWEGTQFTVFAVVSSWEEDHVQ-----GEGC--QC--GDGTS
YCNVLLGKYWDRRPFPGYFDRHSDAR--TYEDF--R--TPNQNSVDISIQFVGNVK----
-----KSS-----

>ScoHcA

M-WS----LALATLFLVLTGTVIR-----ADQ-C-PPVPADTKDKL
EKILELIGHVNRPLTPETP----EP-----AGYDE--TKLKGLGILP
QHEIFSLFDERTWPEATKAAEFLMEA--TDFEHFIQRADVLRHRINEDMFMALNVAVLH
RKDTRGVQVPRIHKIYPDKFLKQDILVEVREKV-----NHGE--EKPVVDATE--LH
QNQLDPNYRLSYFLEDIGMNSHHYHWHVHPAVWLP-KH----GPR-KDRKGELFYMH
HQMVARVYDSERLSNNLPRTEPFENWDDPLEEGYAPHLTIHKTGYNYMFRPEGLIVRDLP-
-ELNKNKMRQWKSRIHGIHLNVLY--AENG--TKISLDNE-----HGIDLLGD
AIESSLLSVNRAFYGNIHCYAHVMAARIADPDGRYGEDNGVMHDVATSARDPLFYRWHKF
IDNIFLEYKDNLDPTYQYELT--WPDVVLNDVTVKPHKG-----
-----DYDDEVHTYWEVDNYELGKGFYTRKT-TA
TVKVRHLQHEDYHYEIDIDNNAGKAKKAVFRIFLAPKYNEKGELFPVNEQRQLLVELDKF
VATLEPGHNVI-ERQSKESVTMSKDHVFGEIRN-----LADDHQC---SCGW
PDYLLLPKGKYEGMTYQLFVVATDYEEDHVEDA-----GEEC--QC--RDSMS
YCGSVEHKLDPDNKPLGYPFDRRIDGT--GFEF--K--TQNMYYGDVVIQFTGETV----

-----TH-----

>SweHcA

M-WT-----LAIATLLIVGTAVS-----ADK-C-PPVPADTKAKL
EKILELVGHVNRPLTPETP-----EP-----AGYDE--AKLKGLGILS
NHEIFSLFDERLWPEAMRATEFLMEA--TDFDHFIRQADVLRHRINEDMFMALNVAVLH
RKDTFGVQVPRIHKIYPDKFLKQDILVEVRERV-----NHGE---EKPVVDATE--LH
QNQLDPNYRLSYFLEDVGMNSHHYHWHVHPAVWLP-KH-----GPR-KDRKGELFYMH
HQMVARVDAERLSNNLPRTEPFENWDDPLEEGYAPHLTIHKTGYNYMFRPEGLIVHDLP-
-ELNKNKMRQWKSRIHGVHLNKLY--AENG---TEIDLSE-----HGIDILGD
AIESSLLSVNRPFGNIHCHYAHVMAARIADPDGRYGEDNGVMHDVATSARDPLFYRWHKF
IDNIFQEYKDNLAPYTQYELT--WPDVVLHRVTVKPHKG-----
-----DYDNEVHTFWEVDKFDLLKGFYTRQT-TA
TVKVRHLQHEDFHIEIDIDNNSGKSKKAIKFRVFLAPKYNEKGELFPVNEQRQLLIELDQF
VATLEPGNNVI-EHQAKESSVTMSKDHVFGDIRT-----LSDDHQC---SCGW
PEYLLLPKGKYEGMTYQLFVVATDYEDHVKDA-----EEEC--LC--RDSMS
YCGSVESKMPDSKPLGYPFDRRIDGT--GFEF--K--TQNMYYGDVVIQFTGETV----
-----DH-----

>SguHcA

M-WS-----LAIATLLVLGTVAR-----ADE-C-PPVAGDAKDKL
EKILDLLGHVKNKPLTPETP-----EP-----AGYDA--AKLKGLGILP
NHEIFSLFDERTWPEAMRAVEFLMEA--EDFNEFMQRADVLRHHINEDMFMALNVAILH
RKDTRGVQLPRIHKIYPDKFLKHDIIVEIREKV-----NHGE---EKPIVDATE--LH
QNQLDPNYRLSYFLEDIGMNSHHYHWHVHPAVWLP-KH-----GPP-KDRKGELFYMH
HQMVARVDAERLSNNLPRTEPFENWDDPLEEGYAPHLTIHKTGYQYMFPEGLIVRDL-
-ELNKNKMRQWKSRIHGIHLNSLY--AENG---TKIILDS-----HGIELLGD
AIESSLLSVNRAFYGNVHCHYAHVMAARIADPDGRYGEDNGVMHDVATSARDPLFYRWHKF
IDNIFQEYKDNLRPYTQYELT--WPDVVLNRVTVKPHKS-----
-----DYDNEVHTFWQVNNYELGKGFYTRQT-TA
TVKVRHLQHEDFHIEIDIDNNSGKNKKAIFRVFVAPKYNEKGYLPVNEQTKLFIELDKF
VADLQPGNNFV-KRESKESVTMSSDHIFGDIRG-----LAHDHQC---SCGW
PDYLLLPKGKYEGMTYQLFVVATDYEDHVKDA-----GEEC--QC--RDSMS
YCGSVEHKLDPDNKPLGYPFDRRIEGT--GFEF--K--TQNMYYNDVIIQFTGETV----
-----V-----

>ScoHcB

M-VA-----KWCVLAMCLLVAVG-----ADK-C-PR-ATDQEAQK
KRMLEVLQHVKNKPYVAETK-----DPK-----IPAGSE--DVFKHLGILE
KHEVFSLFDERQWDEATTAAYMLTA--PSFDEFIDRAEIVRHRINEDMFMALNVAAVH
RDDTRGINLPRIHEIYPDKFLKHKVIVEVKNSI-----NSGQ---EDPLIDATH--EF
TDLRDPNSKLHYFLEDVGLNSHHYHWHVHPAVWQE-SL-EELTHQH-KDRKGELFYFMH
HQMVNRYDAERLSNGLPRSTTFENWNPDIETGYAPHLTIHKTGYRYQFRPDNLVVRDL-
-ELTKNMRQWRDRILYAVHRGEAL--AANG---SSVSLRDE-----RGIDVLGN
MVESSLQSINRPFGNVHCHYAHVIAARIADPDGKYGEDNGAMYDVATSARDPLFYQWHKF
IDNLFHEYKDALKAYSSDLT--YNDITIEEVNVQGE--
-----SPANTVTTFLENSIVHLDEGFSFTARG-HA
RVKVQHLQHEGFNYQIKV--NNAGGEHKVVFRVFLAPKYDEEHHEFDNEQRGMALIELDKF
VATVPAGSSTV-EQHSSKSSVTQSDNDFYGSAT-----RSSENHC---SCGW
PDYLLIPKGNHQGVQFNVIATSYDEDHVE-S-----DESC--HC--GDSLS
YCGALYDKYPDRRPMGYPFDRHADAQ--TFDEF--K--TKNMNSVTVTIKHTGEV-----
-----KDA-----

>SweHcB

M-AT-----MWCVLAMCLLVAVG-----AEK-C-PR-ADDQEAKE
KRMAEVLHHVNRPYVLETK-----DPH-----IPAGSE--DVFKHLGVLD
KHEIFSLFDERQWDEATSAAYMLTA--PNFDEFIDRAEIRHRINEDMFMALNVAAVH
RDDTRGISIPRIHDVYPDKFLKHKVIVEVKNKI-----NGGE---ADPIVDATH--DF
TDLRDPNSKLHYFLEDIGLNSHHYHWHVHPAVWQE-SL-EELTHQH-KDRKGELFYFMH

HQMVNRYDAERLSNGLPRACTFENWNDPIIEGYAPHLTIDRTGYRYQFRPDHLIVRDL-
-ELTKNHMGQWRDRILYSVHRGSAL--AANG---SRVSLRDD-----RGIDILGN
MIESSLQSINRPFYGNVHCYAHVIAARIADPDGKYGEDNGAMYDVATSARDPLFYSWHKF
IDNLFHEYKDALKAYSHDDLE--YKDVTVSDVSVHIEGS-----
-----NVENEIKTYWENNVLHLADGYSFTARG-QA
RVKVQHLQHEDFDYFIKL-NNAGAEQEVVFRFLSPKYDEENHEFDNFNEKRKMAIELDKF
TYLVSAGESTV-VRHSVDSSVTQRIDNFYGDVAS-----RKTDNHC----SCGW
PDYLLVPKGNIEGMMKFDLFVATSAEDVVE-S-----DKSC--HC--ADSLS
YCGTLYDNYPDKRPMGYPFDRHSDAH--TFEEF--K--THNMNSATVTIKFTGEV-----
-----KDA-----

>SguHcB

M-AA-----MWYFVAISLLVAVG-----AEK-C-PK-ATDPEPKL
KKMLDVLHYVNRPYVVESK-----DPS-----VPAGSA--AFFKHFGILD
KREVFSLFDERQWDEATSAVYMLTA--PSFDEFIDRAELVRHRINEEMFYAFSVAHV
RDDSRGISLPRIHEVFPDKYLKYSTIVDVKNKI-----NSGQ---TDPLVDATH--QL
YDLRDPNSKLHYFLEDIGLNSHHYHWHVHHPAVWEE-SL-EKLTGQH-KDRKGELFYFMH
HQMVNRYDAERLSNGLPRAVTFENWNDPIAEGYAPHLTIDRTGYRYQFRPDNLIVKDL-
-ELTKNHMRQWRDRILYAVHRGEAL--AANG---SHVSLREE-----RSIDILGN
MIESSLQSINRPFYGNVHCYAHVIAARIADPDGKYGEDNGVMYDVATSARDPLFYQWHKF
IDNLFHEYKDALKPYTKEDLSKGVENISVDEVTVVGDGG-----
-----SPANTVTTFLQNSIMHLAEGYSFTARG-TA
RVKVQHLQHEGFKFQIKV-NNGGGERKLIFRVYMSPKYDEEHHFSPFNDQRHMAIELDKF
VATVASGDTTV-ERHSSQSSVTQSIENFFGDPNT-----RKTDNHC----SCGW
PDYLLIPKGNIEGVQFNVMATSYDEDHVE-S-----DESC--HC--GDSLS
YCGALYDNYPDKRPMGYPFDRHADVH--TFDEF--K--SKNMNLGVVTIKYTGEV-----
-----KDV-----

>PanHcBI

M-KL-----ILCLTLFIGVAL-----ADRNC-PA-PTNVEAKQ
AMVDNLLTFINKPDNPPAP-----VPNVDP--SKLKGVGYP
KREVFSMFDEREWPEAIEVLKRFLTP--PTFEEFIKVAETLYPRMNEDLFFYCFSVAIVN
RPDAQGVRVPRVQDVYPDKFFEYHLLVSIKDKI-----MTGH---KNPVVNDTH--DF
HNHYDPYRRVDYFTEDMGMNSHHYHWHVTHPLFLPD-VI---EGVH-KDRIGELFYWMH
RQMVARFDSELLSNHLPVSAFEHWDEPIHTGYAPHLTIHRTGYRYLYRPDGLILQDLP-
-ELTKSQMQWKLRLKAIKRSNYV--ATNG---SYVALDKV-----NGIDTLAH
LIISTTGSVNRYYGNLHSAHTIAGKIADASGKYAEDAGVMIDVTTSDARDPIFYQWHKY
IDGLFQTYQKTLKPYNKYELS--FPGVSIEDVHLETESD-RKSEHHDDHHDD-----
-----KHDDKHNESSHDDHHDDHEDVIHTYWTLNDFKLTKGFDYTLDS-EA
IIHMKHIDHEDFTYVFDVVNHDQKEKHAIRVFLRPTYDEAGHEFTPEQFWPLIIELDKF
TYTLKPGHNII-RHNVNESSVTMPREQIYDSVKQW-----STKEHHC---HCGW
PEYMLFPKGNIEGMAFKLFVMVTDWDQDKIS-D-----DTSC--HC--KNSLC
YCGTIFQEYPDKRPMGFPDRPLPKS--GWEAF--R--TPNMFRKDLTVKFTGYSH----
-----IKH-----

>PseHcBI

M-KL-----VICLTLLISVAL-----AEKHC-PA-PTNVDAKQ
AMVDNLLTFINKPDNPPAP-----VPDVDP--AKLKGIGILP
KREVFSLFDERMWPEAIEVLKRFLTP--ATFEEFIKVAETLYPRINEDLFLYCFSVAIVH
RPDAQGVRVPRVQDVYPDKFFEYHLLVNIKDKI-----MSGK---KNPILNDTH--DF
HNHYDPYRRIDYFTEDMGMNSHHYHWHVHLPILPN-VI---SGRT-KDRVGELEFFWMH
RQMVARFDSELLSNHLPRIAFENWNEPIHIGYAPHLTVHRTGYRYMYRPDGLVLQDLP-
-ELTKHQMKVWKSRLKAIGRQNYV--AKNG---TDVAIDPV-----HGIDTLAH
LIISTTDSVNKMVYGNLHSAHTIAGRIADAIGKYDEDSGVMSDVTVAARDPIFYQWHKY
IDVLFQTYQKTLPLPKSHEVG--FPGVTIEDVHIETENDLHKDDHKKDDHND-----
-----HKDDHNDSDHHEAHHHDDHDDVIHTYWTNDFKLKSGFDFTLDS-EA
IIHMKHIDHEDFTYVMDVVNTDAKEKHAVVRVFLRPKYDEFGNKFTPQEIWPMIIELDKF
TYTLKPGHNII-RHNSNDSSVTMPREQIFESAKHW-----STKEHHC---HCGW

PDYMLLPKGNYEGMEYLLFVMVTDWDQDKVS-D-----DTSC--HC--KNSLS
YCGTIFEEYDPDKRPMGFNRPKPG--GWEAF--R--TPNMFRKSLTIKFTGYSH----
-----LKH-----

>ChuHcBI

M-KV-----LICVALLVAVTL-----AEK-C-PV-TIDLQAKQ
DAINRLLKSVNKPFPNPKVSV-----PPMPDD--VSNIKLGVLP
KREVFISFDERTWPEGIEVVKRTTNSKRLLEYFNLNKAEILYPRINEDLFFYCLSVAIVH
RLDTQGLKVPRIQDVYPDKFFEHQLLVKIKDEI-----MTGH---KNPELNDTH--DF
HNHYDLYRRIDYFTEDFGMNAHHYHWHVHPMFKPD-VL----PGGD-KKRSSELGYFWMH
RQMVARFDSSELMNNIPRISFENWNEPIPIGYAPHLTIHRTGYKYGFRPDNMVLRNLP-
-ELTKYEMKQWETRILRSIHKSKIN--QPLG---NSIGLNDT-----DTLAH
LIMSSTDSANRQYYGNLHSAHVIAARITDPRNKFREDGGVMSDAAVSARDPIFYQWHKY
VDSIFQAYQKTLKPYRPSELE--WTDVTVNEVYIDATKE-----
-----HPRNEIRTFWGMNDFRLTKGFDYTIDS-EA
VIHLRHLHDHEPFTYVFDVNNNRNKEREAVFRVYMPKYDEHRTKFSINKQRPLMIELDKF
VRKLHPGHNEI--RRHANDSSVTMPRELIFDRMAD-----TTVEHDQC---QCGW
PEYMLVPKGKYEGMTFQLYVTVTNYEEDFIETE-----DTSC--YC--RNSLS
YCGTIYQEYPDRRPMGYPFDRPIKAR--CWEDF--K--TDNMYRTDVTIRFTGYT-----
-----H-----

>AmaHcBI

M-RL-----VILLVALSAAVCY-----AAK-C-PQ-PTNVAQKQ
AQMDKILSYINKPLNPAPP-----VIDVDK--TKLKGIGILP
RHEVFSVFDERMMWPEAFRVLEKMLAA--QSYDDFIKVAEALYSRINEDLFLYCLSIAIVH
RPDAQGVHVPVRVHDIYPDKFLTNDVIHKIKNKI-----IRGM---KNPIVNDTH--GH
HNHYDLYNRVSYFTEDLGMNSHHYHWHVLHPSIWTS-EI-----G-R-KDRDGELFFWMH
RQMVARFDAELMSNHLPRIRPFENWNEPIEMGYAPHLTVQRTGYTYTFRPEGLTLKDL-
-KMTKSHLRQWRQILADMHTGLVR--AENG---TKVPLSEE-----RGMDTLAH
MVVSTLGSINRDYYGNLHNYAHVIAARIADPKGKHEDYGVMYDATTSAARDPLFYSWHKF
VDYIFNEYQRTLEPYSKNDLY--WDDVILSDIHVDCHRD-----
-----DDHDEIHTFWTRNTVHLEKGFDFTPKS-EA
TVVVRHLHDHEDFTYVFEVDNKAKEKHAVERVFLAPELDDCGHQLTVEDQRLLMIELDKF
VATLKPGHNVV--RRNSNESSVTMPTREIFDGEY-----LVDEDHC---HCGW
PEYMLIPKGNYQGMRYRLFVMSADWDEDKAT-D-----DNSC--HC--KDATS
YCGSIYDEYDPDKRPMGYPFDRQVHY--NWDQF--K--TQNMRSIPIIVKFTGETLPEE-
-----KLH-----

>CleHcBI1

M-RF-----LICAVALLAAVGY-----AAK-C-PA-PTNLDAKQ
GQIDKVLTYFNKPLNPSP-----VSDYDK--TKLKGIGVLP
RHDIFSIFDERVWPEATKVLEKLLAA--PTFEDFVKITEALYSRVNEDLLLYVLSVALVH
RPDTQGVHIPRIHDIYPDKFLTNDVVHKLKDKI-----VHGK---KNPTVNDTH--DH
INNFDLFRVAYFTEDLGMNSHHYHWHVLHPGIWNE-KF-----G-H-KDRNGELFYMH
RQMVARFDAELMSNHLARIKPFEDWSQPIKIGYAPHLTIQRTGYNYMFRPAGLKMRDL-
-ELTKHQMRQWKHRITTAHTGYVL--HENG---TRLSLRDE-----HGIDTLAN
LLVSTVESVNHEFYGNLHSAHVIAARIADPDGKFEDSGVMADATTAARDPLFYSWHKF
IDNIFAQYQESMPAYTKYDLR--WQDVIIKDIDGIDCHEY-----
-----KNEDNIIHTFWTRNTLKLNGFDFTRDS-EA
IVNVKHIDHEDFAYVFHVDNNGKTDKHAVERVFIAPVDERGHHLEVEEQRRLLMIELDKF
VYTLKPGHNEI--RHNSNESSVTMPVREIYGNVEE-----LHDDHC---HCGW
PEYMLIPKGTHQGMQFKLFVASFWDDEDKAS-T-----DTSC--HC--KDSLS
YCGSIYEEYDPDKRPMGYPFDRHVEVN--DWSHI--R--TQNMAYTDLTIKFTGEDRVYEH
N-----HQB-----

>CleHcBI2

MMRF-----VCAVLLAALCS-----AAK-C-PV-PTNLKDKQ
SKIDKILTYFNKPFNPSP-----TSDFDK--TKLKGIGVLP
HGDIFSTFDEQVWPEAIKVLKLLMDA--PTFDDFIKTTEALYSHVNEDLLLYVLSVALVN

RPDAQGVHIPRVHDIYDPDKFITKDVIHELQKLI-----DQGN---KNPIVNDTY--DD
IENSDLNSRVVYFTEDHGMNSYYYRWHVLYPRIWNE-KF-----G-H-KDRKGEHFYMN
RQMVARYDAELLSNHKARILPFEDWNQPIKIGYASHLAIERTGYHYASRQDGLKLRDLP-
-ELTKRQMRQWKREITTTINTENVF--YKNG---TELPLGDE-----HGIDTLAN
LVAPTUVSINRQFYGNLLSAAHAITARITDPDGKYQQESSVMADAATAARDPLFYSWHKF
IDNLFAEYQKSLLPYTEKELT--WDDVAISSISIESNEY-----
-----REEDIHTFWTRRALKFDKGFDFMTDS-EA
IVNIKHVDHEDFTYVFYVDNYGNADKNAIFRVFIAPEVDEQGKPLKVKEQRKLMIELDRF
VFTLHQGNLI-RRSNSNESSVTKPVQEIYGNMGE-----LDDHC----HCGW
PEYMLLPRGTRRGMFNLVVFASDWDKAT-T-----DTSC--HC--KDVLR
YCGSIYEKYPDKRPMGYPFDRMEVN--DWRDF--N--IPNMAIKAFTIKFTAE-----
-----ERV-----

>TcoHcB1

M-KL-----LIIAVALLVTMAY-----ADK-C-VP-SPQTEANQ
ALLDHLLTYINKPANPRPP-----VPLVDP--VLLKGIGILP
KHEVFSIFDERTWKEVVILKGMMDA--STFEFIKFSEKVYPRVNEDFLYCLSVAIVH
RLDAQGVDVPRVHDVYPDKFLTNDIIVKIKNMI-----IHGE---KNPVVNGSR--FF
YNDLDPYHRVAYFTEDLGMNSHHYHWHVHPSIWNK-EL-----GPP-KDRSGELFYWMH
RQMVARFDSELLSTHLPRIHPFESWHDPTITIGYAPHLTIQRTGYNYMNRPEGLTLQNL-
-DLTIHEMNLWHSRILEAIHRHQLH--TKNG---TKIPLDEK-----HGIDLLGH
LVVSTLGSINRKYGNLHSAHLIAGRIADVVKYKHMEDNGAMYDAATSARDPLFYSWHKF
IDNIFTEYQETLRPNKYELT--WPEVIIDDFYVEVNST-----
-----KTHNLIHTYYTSSTLKLKDKGFDYTRDS-EA
KVVIKHMDHEDFSYHIDVDNNAKAPKKAIVIRIFLAPKYDEHGHPLTINEQRVLMIELDKF
IETLNPUGHNVI-HRSSINSSVTINSKQIFGDRKI-----YKDNDHC----HCGW
PDYLLVPRGDYDGVHYELFVMASEYEKEKVS DK-----PTSC--RC--KDSLS
YCGTIYEEYPSNKPFGYPFDRVIRVR--GWEEF--K--TQNMFDTDVTIQFTPTF-----
-----Y-----

>SpiHcB1

M-KL-----FILAVLLATTAI-----AEK-C-PK-PVNVEAKQ
KMVDTLISYINKPANPVPP-----KPPIDP--KKLIGIGILP
KDQVFSLFDERTWDEVSEVLKRFMAA--PTFEDFIKVAETLYPHVNEDLFLFGLSVAIVH
RPDANGVHVPRVHEVYPDKFLTNDVLINIRKQI-----IKGH---KNPVVKDTH--YY
HNDFDPFRRVDYFTEDLGMNSHHYHWHVHPSIWTQ-DI-----G-E-KSKLGELFYWMH
RQMVARFDSELLSVHLPRISSLDDWNKKVKIGYAPHLTIQRTGYTYMNRPENLEIEDLP-
-ELTKGELMQWKNRIMEAIARHNITLKGGPG---KKLRTTPE-----NGIDIFGH
LIAATKNSTNRRYYGNLHSAHVIAARIADSDGEHMEDNGAMYDVATSARDPLFYSWHKF
IDKLFTEYQMTLTPYTPYQLT--WPDVVVDGIHIENLKT-----
-----HEENMIHTYYTSSTLRLSKGFDYTKDS-EA
KVIVEHTDHDDFVYVIDIDNNARVEKTAVLRIFLAPKYDERGHPLTLKEQRVMMIELDKF
KATLKPGHNVV-RRCSNESSVTMPVDHIYGDITR-----TVDEDHC----HCGW
PEYLLVPQGDYDGMHYELFVMATNYDEDKAQDT-----DLSC--KC--HAHS
YCGNILGEYLDKRPLGYPFDRKIKAT--GWAEF--K--TQNMCDADIVIKFSGKN-----
-----KDH-----

>AgiHcB1

M-KL-----FVLAVLLATTAI-----AEK-C-PK-PVNVEAKQ
KMVDTLISYINKPANPVPP-----KPPIDP--KKLIGIGILP
KDQVFSLFDERTWDEVSEVLKRFLLA--PTFEDFIKVAETLYPHVNEDLFLFGLSVAIVH
RPDANGVHVPRVHDVYPDKFLTNDVLINIRKQI-----IKGH---KNPVVKDTH--YY
HNDFDPFRRVDYFTEDPGMNSHHYHWHVHPSIWHQ-GV-----G-E-KAKLGELFYCMH
RQMVARFDSELLSVHLPRISSLDDWNKKVKIGYAPHLTIQRTGYTYMNRPENLEIEDLP-
-ELTKGELMQWKNRIMEAIARHNITLKGGPG---KKLRVSPE-----TGIDVFGH
LIAATKNSSNRQYYGNLHSAHVIAARIADSDGEHKEDNGAMYDVATSARDPLFYSWHKF
IDKIFTEYQNTLTPYTPYQLT--WPDVVVDGIHIENLKT-----
-----HEENMIHTYYTSSTFRLSKGFDYTKDS-EA

KVIVEHTDHDFFVYVIDIDNNARVEKTAVLRIFLAPKYDERGHPLTLKEQRVMMIELDKF
KAPLKPGHNVV--RRCSNESSVTMPVDHIYGDITQ-----TVDEDHC---HCGW
PEYLLVPQGDYDGMHYELFVMATNYDEDKDQNA-----DMSC--KC---HAHS
YCGNILGEYLDKRPLGYPFDRKIKAA--GWEEF--K--TQNMCDTDVVIKFSGKT-----
-----KAQ-----

>CanHcB1

M-KL-----CILAVAILVSAAL-----ADKQC-PP-PTNVEAKQ
QLIDNIVSYINKPANPVPP-----IPPTDP--SKMKGIGKLP
KDQVFSLFDERCWPEVTVVLKKMMAA--ATFEDFVKVAETIYPRVNEDFLYALSVAIVH
RPDAQGVHVPRVHDVYPDKFLTNDILVRIKNLV-----IKGT---KNPVVNDTH--YF
HNHFDPYRRVDYFTEDLGMNSHHYHWHVLHPSIWN--SM-----G-M-KDRVGEIFYWMH
RQMVARFDSELLSNHLPRIAPLDDWNEKVKIGYAPHLTIQRTGYTYMNRPENLELEDLP-
-ELTKGEMLQWKNRILDAIHRHNIT--KLDG---TKLKMTEE-----DGIDVLGH
LIASTVNSVNRYYGNLHSAHVLAARMADTDGEHLEDNGAMYDVATSARDPLFYSWHKF
IDKLFTEYQMTLKPYSEYELT--WPEVVIDAVHVENCRT-----
-----NEQNHIDTYTTSILRLTKGFDYTKDT-EA
KVMVKHMDHDDFTYVIDVDNNAKVEKTAVFRVFLAPKYDERGHPLTLKEQRVMMIEMDKF
KKVLKPGHNVV--RRFSNESSVTMDTDHIFGDIKT-----TEDEDHC---HCGW
PAYMLVPQGDHGVHFEFVFMATDSEKDKVATA-----EVQC--HC--KEAFS
YCGTIYGDNPDKPMGFPFDRKMKAK--GWEEF--K--TCNMQDADITIQTQDV-----
-----KSH-----

>ProHcB1

M-RL-----LVLALACLAAYAYA-----GDV-C-QP-ATNVESKQ
GLINNLLTYINKPVNPSP-----VPQVDS--SKLKGIGLLP
KRKVFSVFDERWVWPETERILEKFLTA--PTFEDFIKVAETIYPRVNEDFLYCLSVAILH
RPDATGVHVPKVMVYPDKFIHRDVIMRLKNKV-----MAGQ---KNVIINGTL--TH
NNYLDPYRRVEYFTEDIGMNSHHYHWHVLHPIVWSS-KL-----GNP-KDRPGEFFYWLH
RQMVARFDSELLSEDIPRIEPFDNWNNEPIMIGYAPHLTVQRTGYEYMFREGLVLDNLP-
-ELTKDEMYQWRMRILEGVHRGRLT--LDNN--TKHELHGEDHHDNDEDEIHAIDTLAS
VVVSSRTSLNKEYYGNLHNYAHVIAASKIADSHGQHMEDYGVMYDATTSAARDPLFYSWHKF
VDSIFTEYQHTLEPYTHYELT--WPDVSLEELYVLDDEE-----
-----NEVNNLRTFYDTIPMKLYKGFDFTRDT-EP
TLIIKHLHDHDDFTYHIKAKNHAKTPKKAVIRIYLAPKYDEHYHAFEPNEQRLLVIELDKF
STALKPGVNNP--ERHSNESTVIMNKNFIYDGRLA-----KIHDHHC---WCGW
AENLLIPKGTIEGMSFYLFVMTDYESEIPDA-----LNNPC--LC--KDAHS
YCGTIFGKYPGKRPFPGFDFREISEQ--GWEEF--E--TQNMISEEITIHFTCEGEH---
-----HRH-----

>SmuHcD

M-GV-----WSLLVFVVLFAFARSHHH-----HES-CSKVYAQDYQLKQ
QEIQDLVDLINKPIRPDYQ-----DS-----RYVVEE--RDLKGLGRLP
HDEVFSLFDERNWDETLQVIHLLTHA--PTYSKFLETARVVLPRVNEDFLYALSVTLTL
RPDTRGVHVPRVLDSPDKFLSRFVIVRLKELT-----RNGQYRNQVPIVDATQ--VR
SQSRDPNHDLDYFLRDPALNAHHYHWHVQHSPLLNE-KF-----GH-SDRQGEYFFWMH
KQMVSRYDTALLSAGLRRVSPFENWNEPIQIGNAPNLEIDKTGYRYAYRPPGMVLENLP-
-NLPKNRMNEWNRNLVASIHKGYLV--AENG--SRVVL DGE-----TGIDYLG
TIEANKQSVNSRLYGNLHGYAHIIAGKIMSPKGAPGERNGAMYDVATSAQDPLFYSWHRY
IDNILQEYKE-LHSYSRKELT--WDDVEVNQVQVKTAD-----
-----GEQNTVRTYWQTSLSYISIGKGFFTQNS-RA
LVKFRHLNHEPYYYEIHVNNKAKSQRNAAVRIFGAVTEDEGEQLPLNSQRHLIIELDKF
VYPLQPGDNKI--VRYANQSSVTASEDSFFKPINQ-----LPPESSC---HCGW
PQYLLLPGGRYEGLPFRVYVVVTDWDQDKVS-D-----EEQC--LC--TDATS
YCGTPNQINPDGRSLGFPFDRKRIKER--NFQFF--R--TPNMGSTDINIRFTGKYLPSVI
GKQH-----KQY-----

>SbaHcD

M-GV-----WSAFVLLAVFAIVKGHHH-----YEK-CSKVYTNEIQSKQ

QEIQDLVDIINKPVRPEYQ-----NS-----RNVVEE--KKLIGLGRLP
RDEIFSLFDERNWDEAIQIIRLLTEA--PSFEHFLATARVILPRVNEDLFLYSLSVALTL
RPDTRGVRSRVLVDVYPDKFLPRDVIVRLKEAT-----RWGQYRDKVPIVDGTV--GN
SNDDPDNHELDYFLRDPGLNAHHYHWHVQHSPLLDN-SM-----QH-SDRQGDHFFWMH
KQMVARFDNSRLSAYLPRVIPFENWNEPIQVGNAPNLVIDKTGYRYAYRPPGIVLHDL-
-KLPRNKMIGWRNQLVTSIHKGYL- -AANN-- -TRVNLDVD-----NGIDYLG
AIEANRQSVNPELYGNLHGYAHVIAGRNVAPKAPGEKNGAMYDVATSAQDSLFFYSWHKY
IDNILQEYKE-LHSYKREELL- -WDEVENVQVRVKTSS-----
-----DVKDTVRTYWQNSYYPIGQGFTFTQNS-RA
LVKVRHLNHEPYYYVISLRNKANAI RNAAVRIFGAVTQDERGQSLPLNSQRHLIELDKF
VVPLKPGENII-TRQANESSVTIPEDIYNPVNE-----VRPDSAC----HCGW
PQYLNLPKGRYEGLPFRVYVVVSNWDQDRVT-D-----EVSC--LC--SDAIS
YCGAPGQINPDRHSLGYPFDRRINQR--TFEAF--K--TPNMGSTDINIKFTGQYLPSSN
VNRF-----QHYSSNVYS---VL

>SweHcD

M-DT-----RVLRLTLALVALSGVLAE-----HHHDEH-CKNAYVADYKLKQ
REVQHLVDSINKPVYPDFK-----DT-----RGIIDE--RKLKGLGTLP
RREVFSLFDERNWAEAEQVVELLLEP--TTFREFIQLADIIRHRVNEDLFLYAFSVAIAH
RPDTQGVQVPRVQDSYPDKFLRKEIIHKIKEVM-----NEGQYLDKIPVIDATE--VS
ENHLDTNQELLYFLEDIGMNSHHHHWHVHHPAIWLP-KH-----GGL-KDRKGELFFYMH
KQMVARYDTERLSNNLARVRPFENWNEPIEEAYSPHLIVDKIGYKYAYRPHGITVQNL-
-NLPKSKMVEWKNRILASIRKGSV- -ASNH-- -TYISLNDN-----HGIDILGD
IVESSLLSVNRVLYGNLHGYAHVIAGKVTDPHNTYEEKNGAMYDVATSARDPLFYSWHKF
IDNIFQEHHKETLHPYTKDELN--FPEVQVDNLRVTVENG-----
-----TYENIVRTYWQNSLYHIAKGFTFTPTG-PV
LVKVKHINHETFYNNLEITNNALTEKHGVVRIFGAVIKDERGHTLNLNDQRHLAIELDKF
TVTLQPGKNNI-RQPCYESHVTAKWDVFFSDVNS-----QKPEEGC---NCGW
PDYMLIPKGKYEGLKFRVFAVTDYDQDKTS-D-----HDPC--LC--GDAVA
YCGAHNQYPDKKPMGFPPDRHIDDR--TFDQF--H--TPNMIATDVSIFKFTGEFLPPK-
-----GDI-----

>ScoHcD

M-DT-----RVLRLTLALVALSGVLAD-----SES-CSSAIVNDYKLKQ
KEIQHLVDTINKPVYPDFK-----DT-----RGIIDE--SKLKGLGTLP
RREVFSLFDERNWAEAAKVVELLLEP--KTFREFIHLADIIHHRVNEDLFLYALSVAIAH
RPDCQGVQVPRVLDIYPDKFLRKEVIHKIKEVS-----NEGAYLDKVPVIDATE--VS
DNHLDPNQELLYFLEDLGMNSHHHHWHVHHPAIWLP-KH-----GGV-KDRKGELFFYMH
KQMVARYDTERLSNDLPRVRPFENWNPIDEGYSPHLIIDKTGYKYAYRPQGVIVHDL-
-NLPKTKMFEWKNRIMVGIRKGLI--SANK-- -TQVPLNND-----HGIDLLGD
VVESSLLSVNRVFGYGNLHGYAHVIAGKVTDQPSTYGEKNGAMYDVATSARDPLFYSWHKF
IDNIFQEHHKETLQPYNKDELN--FPDVQVDSLRINVANG-----
-----TYENIVRTYWQNSLFKIAKGFTFTTEG-SV
LVKVKHLNHETFYNNLEVTNNALEEKHGVVRIFGAVINDERGHPYILNDQRHLVIELDKF
TVNLKPGKNSV-RQPCYNASVTAKYDVFGDVES-----QKPQEGC---NCGW
PDYMLLPKGKYEGLRFRVFAIVTNHDEDKVS-D-----QETC--LC--GDAVA
YCGAHNQYPDKKPMGFPPDRRIDER--TFEHF--H--TPNMIATDVIIKFTGEFLPPK-
-----GDI-----

>SguHcD

M-DT-----RVLRLTLVLVALSGVLSL-----HKQ-CEHHVVNDHKLKQ
REIQHLVDTINKPVYPDFK-----DT-----RGIVDE--EKLKGLGTLP
RREIFSLFDERNWAEAAARVVELLLEP--KTFKDFLQLANIIRHRVNEDLFLYALSAVAH
RTDTQGVHVPRVQDSYPDKFLRKEVIHKIKEVM-----NEGAFLDKIPVVDAT--VS
ENHLDPNQELLYFLEDLGMNSHHHHWHVHHPAIWLP-KH-----GGL-KDRKGELFFYMH
KQMVARYDTERLSNDLPRVRPFENWHEPIEAGYAPHLVIDKTGYKYAYRPQGVIVHDL-
-NLPKNKMFWEKNRILSSIRKGYLT--ASNY-- -SQIPLNDE-----HGIDLLGD
AVESSLLSVNRVFGYGNVHCYAHVIAGKVTDPSGTYGEKNGVMYDVATSARDPLFYAWHKF

IDNIFQEHKETLHPYTKDQLN--FPDVQVDSFSVTVNG-----
-----SNENIVRTYWQNSMFKISKGFTYTPTG-PV
LVKVKHLNHETYYNLEITNNALSDKHAVVRLFGSVINDEHGHSNLNDQRHLVIELDKF
TATLKPGKNKI-KKGCYESHVTAPWETYFSNVNS-----QSPEEGC---HCGW
PDYMLIPKGKYEGLPFRVFAVVTDYEDDRAS-E-----QEPC--LC--SDAVS
YCGAHNQIYPDKKPMGFPFDRRIDDR--TFELF--H--THNMIATDIKIRFTGEYLPK-
-----GDI-----

>NadHcD

M-RT-----WTFLIFLWGIAHAHHHLGQQWQGQRYHYQQQEGVHGS-WSVAQGYELKQ
QEIQSLVDLINKPVRPEYE-----YP-----DDVVDE--DDLHRLGHLR
RDEVFSLFDERNAQEVIDTIRILYEA--PTYDEFLSRARVIRQRVNEDFLYGLSVAITI
RNDTRGIHVPRVHDIYPDKFLTRDVIQRIKEAT-----RRGHYRDVVPVIDATE-PEA
YNSADPSQQLAYFLNDVARNSHHYYWHVLHPAVRGE-EL-----GGA-SDRQGEIFYWTH
KQMVARYDTELLSNQLPRATPFENWNEPIEIGYSPNLAIDKTGYQYAYRPSGVVLKDLR-
-NLPRNKMIQWRNNLVDSIHEGYLL--SENG---THIKLDNN-----EAINYIAS
ALEASRVSVNRRLYGNLHNYAHVIAASKVTTTPSEARWERNGVMYDVATSARDPLFYSWHKY
IDNILQEHKEQC-SYSREERS--WDDVEVNSVQVVAYGD-HPEDHQGHGHGGQHHWHGQ
QWHQGGRYGNIRGGHYWNQQAQTQKNERQSQPNVVRTYWQNSVYEIGKGTYPKS-KA
LVKLHHLNHEPYNYSISVTNNAGSQREVVVRIFGALTEDERGHTFDLNEQRHIVLELDFK
RAVLKPGQNKI-ERSSLDSSVTSHGRSFYEPVER-----LYPEDAC---QCGF
PNYLLLPRGQPEGTFNQIYVVLTAEDIVQEQHHHEHQQQQHQYQDD--IC--WKNIN
YCGSPWQRYPDRRPLGYPFDKRIDER--NFDWS--R--TSNMGSTNITIYFTGEYMEPSY
REYEWAAAA-SIHLRRQ-----

>ScoHcC

M-GA---WKVWTFFAIALVVAVKAYDE-----EAK-C-MSHDEDSQVKE
RQILHIVDSINKPISPDR-----AP-----RGVIDE--HKLRGLGTLK
KREIFSLFDERNWD EASKVVRLLDA--KDFDDFIDVAEIVRLRVNEELFLYAFSVAVMH
RGDTQGLQVPRIHDIFPDKFLKEDVIHRLLELS-----NRGEHYDRIPIDATQ--IS
HNYLDPNSELEYFLEDLGLNSHHHHWHVHHPAIWVS-EL-----GNE-KDRKGEFFYWMH
HQMLARYEAERMSNGLARTRTFQNWNDPIDEGYAPHISIMKTGYTYAYRPPGYTLRDLR-
-NLPKNKMVEWAKRVLYSIHSGIFH--FSNG---TDAHLDTE-----HGIDELGN
IVESSLTSLNRDYYGNLHCYAHVIAGRIADPEGKYGEDNGVMYDVATSARDPLFYRWHKY
IDNIFQEYKNTLPPYTTEELTPQNSEFRVQGISVVGET-----
-----SARDTVHTYWQHSLLKVGQGFEFTKHT-PA
YVKVKHLQHESFTYVIDVENR-GRTRTGFFRIFAAPKYNELGQKWHINDQRLIMVEMDKF
IEKLYPGKNTI-ERHSEDSTVTMSSASIFSDISS-----EQSEDHC---SCGW
PDYLLVPKGNFEGFPMVEFVIVTDYEDKVEGP-----DEGC--AC--HDALT
YCGGIDYHFPDKRAMGFPFDRPIKQR--NFNAF--K--TKNMGKVTVDVKFTGETIAPED
FH-----NQH-----

>SguHcC

M-GA---WKIWTCTVALALAVTVSAYVE-----EER-C-DDVSDDTKLKQ
RQILHLVDSINKPIAPDR-----AP-----RGVIDE--HKLKGLGTLR
KREIFSLFDERNWE EASKVVQLLEA--EDFEKFIDIAEIVRLRVNEELFLYAFSVAVIH
RGDTQGLQVPRIHDVFPDKFLKEDVIHSLQELS-----NRGEYYDRIPIDATQ--IS
HNYLDANSELDFLEDLGLNSHHHHWHVHHPAIWVP-EL-----GST-KDRKGEFFYWMH
HQMLARYEAERMSNGLARTRTFQNWNDPIDEGYAPHISIVKTGYTYAYRPPGYTLRDLR-
-NLPKNKMVEWAKRVLYSIHSGIFH--HPNG---SDVNLDVN-----SGIDVMGN
LIESSLTSMNRDYYGNLHCYAHVIAGRIADPEGKYGEDNGVMYDVATSARDPLFYRWHKF
IDNIFQEYKNTLSPYTHDELIPHASEFRIQGVSVVGET-----
-----SERDTIHTYWQTSLLKVGQGFEFTKHT-PA
FVKVKHLQHEDFNYYIDVENR-GKTRTGFFRVFAAPKYNELGEKWHINDQRLIMIEMDKF
IHKLYPGKNTV-ERDIFDSTVAMSSANIFSDVTS-----GQSEDHC---SCGW
PDYLLVPKGNFEGFPMVEFVIVTDYEDKVKSQ-----QDSC--PC--HDALT
YCGGADYQYPDKRAMGFPFDRPIKER--TFDAF--K--TKNMGSVTVKVKFTGEAISPED
YH-----EEH-----

>SweHcC

M-GA---WKIWTSLAVALVVVANAYDE-----ESI-C-TSHSEDASVKQ
RQILHLVDSINKPIAPDFK-----AP-----RGVIDE--HKLRGLGTLK
KREIFSLFDERNWDEAAKVQLLLLDA--NDFEEFIDIADVIRLRVNEELFLYSFSVAVMH
RGDTQGLQVPRIHDVFPDKFLKEDVIHQLSLS-----NRGEHYDRIPVDSGH--IT
HNYFDPNSELDFLEDGLNSHHHHWHVHPAIWVP-EL-----GSE-KDRKGEFFYWMH
HQMLTRYEAERMSNGLPRTTRTFQNWNDPIEEGYAPHISIMKTGYTYAYRPPGYTLRDLP-
-NLPKNKMVEWAKRILTSIHSGYFH--FENG---TKARFDVE-----HGIDHLGN
LIESSLTSINRDYYGNLHCYAHVIAGRIADPEGKYGEDNGVMYDVATSARDPLFYRWHKY
IDNIFQEYKNTLTPYTAEELTPHTSEFRVAGVSVHSGT-----
-----SERDTIYTFWQDSLLKVGQGFEFTQHT-PV
FVKVKHLQHDTFDYIIDVENR-GKTRTGVRIFAAPKYNEHGEKWNINEQRLIMIEMDKF
THKLYSGKNTI-ERSSSESTVTMNSAGIFGDVSS-----EHAEDHC---SCGW
PEYLLVPKGNFEGFPMEIFVVITDYEEKVTSH-----DEGC--PC--HDALT
YCGGIDYKVPDKRAMGFPPDRPISHR--FFDDF--K--TKNMAKTTVHIKFTGETIAPED
VH-----DEH-----

>PanHcC

M-KVDSGFTLFFFLLAVSGLAVQAIK-----DTH-C-AQ-ATNTKLKQ
LQITQIISKINKPVAEIR-----SS-----ENIEK--SRLRTLGLQLP
RREVFSLFDARYWNETSQVLDLLIEA--KTFFDFIKRSEVIQPLVNEELFFYAFSVAFLH
RQDTHGLHVPRVHYVFPDKFLKTEVIQKMKQLT-----YNAERYGKSAIVEGNDLSHI
HNYDYDTHDELSYFTEDVGMNAHHYHWHVNPVAVWKN-KY-----GNY-SDRKGEFFYWMH
SQMVARYDIERLSNGIPRTVPFQSFNDEIEEGYNPHLTMAKTQYHYAYRPPHFTLQDLP-
-TLPKSRLQEWSNRLFHAIHTGQLT--RPNG---RKLALNNE-----HGIDYLAN
TIEANYDSVNYKLYGNLHCYAHVISAKITDPTTAYNEDYGVMYDVATSARDPLFYRWHKF
INKFFSEHKMLKPYTKDELD--FPGVKVEKVSQVQTST-----
-----SEPNLIRTFWQDAHLKVREGFLFTRQS-PA
YVKLTHLDHETFTYRIDVNN-GGSAHEAVVRIFLAPVYDEFERFDIKHQSLMIQMDKF
VTKLTPGKNTI-VRSSLNSTVTMEANSIFGAKRP-----SKTIDNC---RCGW
PDYLLVPKGNYEGMKFQLFVMDWDWAKDENTES-----RGNC--FC--KDSL
YCGGIDSKYRDTKPFQFPYDRRIKAE--SWQDW--E--TDNIAHTDITVKFVGDDLHDT
PEEF-----SDD-----

>PseHcC

M-KMDSGFTLSLLLVLVSSFAVQALVK-----ETH-C-AK-PTNTKLKQ
LQILQVSSINKPVAEIR-----DS-----TNIIDK--SKLRNLGLQLP
RREVFSLFDARYWNETSQVLELLLEA--KTFFDFIKRSEVIKPLVNEELFFYAFSVAFVH
RKDTQGLSVPRVHMFVFPDKFLKTPVIQKLKQLT-----YNAERYGKSPIVEGNDFSHV
HNYLDTHDELSYFTEDLGMNSHHYHWHVNPVPAIWK-TY-----GNY-SERKGEFFYWMH
SQMVARYDIERLSNNLPRVTPFQSFDEIDEGYNPHLTMAKTQYHYAYRPPHFLQDLP-
-TLPKSKLQQWSNSLFAIHTKQLT--RPNR---SKVSLNNS-----RGIDHLAN
TIEANYDSVNYQTYGNLHCYAHVIAAKITDPTTAYHEDNGVMYDVATSARDPLFYRWHKF
LNKFFTEHKKTLNMYSDDDLK--FPDVVKDKVSVQNG-----
-----SEPNLIRTYWQDAHLKIREGFLFTRQS-SA
YVKVTHLDHENFNIRIDVTN-TGGPHEAVVRIFLAPVYDEFERPLDIKHQRPLMIQMDKF
LAKLTPGKNTI-VRSSQNSTVTMDSRSIFDSYH-----SKTNDNC---RCGW
PDYLLVPKGNYEGMKFQLFVMLSDWAKDEDTH-----RGNC--FC--KDSL
YCGGLDAKHRDVRAMGFQYDRRIKAE--SWDEW--E--TDNIAHTTITIKFVGDELHETH
PEHF-----ED-----

>AmaHcC

M-RL-----LFGLAALLLVTLV-----VAKREDL-C-EY-PKDAKLKQ
RQIINIISTINKPISPIYR-----ES-----RDVLTE--YQLQGLGILP
KTEVFSLFDERYWNETIHVLELLFEA--HDFDDFIKRSEVIRLRVNEELFFYAFNVAVLH
RSDTQGLQLPRIHKVFPDKFLKESVMRKMIETN-----QKAKYIGKSPIIDTAG--DL
YNHLDNMSELNYFTEDVGLNSHHYHWHVLPVPAIWLE-EF-----GGK-KDRKGEFFYWMH
QQMVARYDIERMCNHLPRVKALWNLNEEIEEGYEPHLMVKTQYHYAFRPPHSTLHDL-
P

-DFPKSKMFEWARRILDGIHKGFFI--HKNH---TMVKLDEK-----NGINLIGN
AIEANLDSVNCHLYGNLHCFAMLAASVTDPLGTFGETHGAMYDVATSARDPLFYRWHKY
INHFFEQHKMLTPYTHDDLE--WSDVHVNGISVQGRG-----
-----SGPNEIRTYWQRTLSQIPKGF EYTK EY-PA
KVAYTHLQHNFYVIEIENRARTAKLGLVRIFIAPVYNELGRKFTINEQRLLVIQMDKF
KVRLSPGRNTI-RRNADNSTVTMTSKNIFAPITQ-----LKDEDHC---RCGW
PDYLLVPRGDFNGKKFRLFVIVTDFEKDFVP-V-----SGSC--MC--RDGLG
YCGGINTKYPDRRAMGFPFDRKIHFF--NWDEF--E--TDNMARTKISIRFTNEFMPPRD
YDDH-----QFR-----

>CleHcC

M-RL-----LVCTLVAALVVVATGADR-----RDFPKKTDf-C-GE-PKDAALKQ
RIIINLISTINKPVSPVYR-----DS-----HGIIDD--YKLMELGVLP
RDQIFSLFDERNWNETITVLDLMFGA--KTFSDFIKVSEVIRFHVNEELFFYAFTVAVLH
RKDTKGLQVPRVHKVFPDKFLKEAVIQKLRETS-----KKAKYMGRSPVVLGVS--DL
FNHQDINTELNYITEDVGLNAHHYHWHMTMSPLWKD-SF-----GGH-KDRKG EFFYMH
QQMLARYDVERLSHHLPRVKPFQNWNSKIKEGDFPHLTMVKTQYHYAYRPPGYTLKGLR-
-DLPKSKLSVWEERLYYAIHRGFVL--DKHN--HKIYLNGT-----DGIDILAN
AIEANLDSVNCHLYGNIHCYAHVIAAKITDPLEAFGETAGAMYDVATSARDPLFYRWHKY
IGNFFLEHKMMLTPYKTDLN--WDDVTVKGISVHGRG-----
-----SAHNVIHTYNQHTLMRIPKGF EFTQDF-SA
IVKLQHLQHESFEYVIDVVSKAATPKLGLVRIFLAPVENEMGRKFTINEQRQLMIKLDTF
STQLHPGKNII-RRSSENSVAMTSHSLFDDFED-----LKDEDHC---RCGW
PDYLLLPRGDFDGMKFELFVTITNFKRLEST-----TGNC--MC--LDGLA
YCGGVDPYPDKKPLGFPYDRKIKNL--TWDEF--E--TDNMAHTPITIQTGEFLPPRD
F-----FHH-----

>CanHcC

M-RL-----LLFSFVVS LTVVSTWG-----LIRTKHY-C-DL-PNDIILKQ
RQIIHISSINKPITPDFR-----ET-----EGVLEE--YQLRGLGHLP
KNEIFSLFDSRNWNETIKVIKLLKA--PTFDDFVKRSEVIHLRVNEELFFYAFSAVLH
RQDTQGVHLPPAYKVFPDKFFKDHVHKLEVT-----RKSXYLGKTPIVDGTE-EDP
YNYLDPNHALEYFTEDVGMNSHHYQWHTINPAIWLN-KF-----GDY-KDRKGELFYWMH
QQMIARYDAERLSNYLPRIKPFEDWDEKIEDAYNPHLTMAKTQYQYAYRPKNYVLRDLP-
-ELPKSKLMTWTLSLANAIQRDRLL--ASNG--TIVPLNCS-----SGIDEVGN
AVEANFDSVNMKLYGNLHCYAHVIAGKITDPKGSYQENGVMYDVATSARDPLFYRWHKF
INSLFVKHKKMLTPYTKDELE--WTNVEVRSVSVRHHG-----
-----SRSNKIRTYWQNTLVKINQGFVFTRES-PA
YVKLHHLQHNFDFIIEAVNRASSPKYGTVRIFMAPVYSELDRKFTVNEQRLLMLEMDKF
VTKLAPGKNTI-TRNSKNSTVTLSENLYAPSMA-----LRLNDHC---KCGW
PDYMMIPKGTHSGMEFQLFVTITDYEEKVK-S-----QGSC--FC--KDAFS
YCGGIDAKFPDKRAMGFPFDRKIKAY--GWDDF--E--TDNMVHTTVIVKFTGETLAPQD
F-----YHL-----

>ProHcC

M-RL-----FVFLVAALAIATEA-----LVKKDDR-C-EV-ADDLILKQ
EIVIQLISTINKPFSPRYR-----DP-----KGILEP--HQLKGLGKLP
RNEIFSLFDQRNWD E TIHVIELLLDA--VDFDDFIERSEVLLL RVNPELFYYSFAVALLH
RDDTRGIHVPRVQYVFPDKFLKEPVIEKLKHLT-----SIPA-GNQPPIVDFHE-GDE
GSTLDPNWAVTHFTEDIGLNSHHYHWHTVNPAVWQD-KF-----GE-KDRKGELFAYMH
LQMINRMDAEYLSEHRPRIKPLNNWDEIEEGYDPLAIAKTRYHYAYRPPHYVMKDL-
-DLPKTKMAEWSVRLFNCIHRGRLI--AANG--TEVPLDPE-----HGIDILAN
AVESNYDSVNPDFYGNISYAHVLAARITDPGAYGEDSGVMADTATAARDPLFYRWHKF
IHFFFREHKEMLPPTYREELN--FDDVIVKGVTVQGE-----
-----SKPNLINTHFQNTLFKVHQGFVFTKNS-KA
YVRYPHIQHEDFEYIIDVENK-GVSKKAVVRIFIAPFYDELGRKSTPNQVRRSVIEMDKF
SVKLTSGKNTI-RRSCANSTVTAPARSIFGSPKD-----LLKEDHC---RCGW
PDYLLVPTGTREGMKFHV FVILT DYDEDKVTDG-----HHQC--YC--KAAVS

YCGGIEAKYPDRRAMGCPFDRKVKAC--DWQQF--K--TENMAAGKFIIKWNDDFLPPQD
FHH-----RRY-----

>PanHcBII

M-KS-----VLLIVIAVCVSAIN-----AA--C-PAPTGDVCLKQ
SQIQKIVEHINRPYVAETE-----LLTGDP--AKFKGLGNLH
HEQIFSLFDERQWPEAIKVLELLTGA--PTFEEFLKVAEAIKQVNEDLFFFAFTTAVVH
RPDTQGLQVPRIQDVFPDKFFTQEVIAQIKEAS-----HRGE---KNPIVNDTC--HY
GNILNVNNRLTYFTEDMGMNAHHFHWAVNPAPIWLD-KF-----GGV-KDRRGEAFYWMH
RQMLARYDAERLSNNLPRTTPEEWDHPIHEGYAPHLTVDRGTYSFRPEDLTLHNLPL-
-ELTKNQMLLWRNRWDITHSGLY--AKNQ---TKIRLLDD-----PQGTDLIGH
ILESSLQSVNRPFYGNLHCAHVIASEITDPDGKYEYHGAMYDVITSARDPLFYRWHKF
IDNIFHDYKNTLPEYKSTEVA--WGEVQIESAEIKGDKS-----
-----EDKNLITTFWDHHPFKIGKFFSFTAQN-TA
EVRISHLQHEGFTYKFDLVNNAAGDSKEAFIRVYLAPKYDETGKKFTADQLRPLLIETDKF
LVKLKPGKNSI-TRHSESSVTVPDKQIFGLQDT-----TESKDQC---RCGW
PNYLLVPKGKREGMKFRLIVVATNWADDKLH-D-----DTSC--MC--KGSPA
YCRLLYNQVPDRRPLGYPFDRVIGTR--KLEDIHQK--VQNLFATDVTIKFTGEAL----
-----H-----

>PseHcBII

M-KS-----LFILLAICVAAIH-----AA--C-PAPTGDVCLKQ
SQIQKIVEHINRPYVAETE-----LLTQDP--SKLKGIGKLP
HHKVFSFLFDERQWPEVVKVLELMTSA--STFEDFLKVSEAIRQVNEDLFFFAFTAAVVH
RPDTQGVHVPRIQDVYPDKFFTQEVITQIKEAI-----HRGE---KNPIVNDTC--HY
GNTLDINNRLTYFTEDLGMNAHHFHWAVNPAPIWLD-KF-----GGV-KDRRGEAFYWMH
RQMLARYDAERLSNFLPRTTPEFEDWDHPIHEGYAPHLTVDRGTYYAFRPEDLVHNLPL-
-ELTKNQMLLWRNRWDITHSKVLV--AANG---TKVELRED-----PEGTDVLGH
LIESSLQTQNRFLFYGNLHCAHVIASRITDPDRKYEYNGVMYDVTTTSARDPLFYRWHKF
IDNIFHDYKNTLDEYKPTVEVS--WNDVRVESAEIKGDKS-----
-----EAKNLITTFWDTHPFKIGKFFSFTAQS-TA
EVRVSHLQHEGFTYKFDLVNNAAGDSKEAFIRVYLAPKYDETGKFTADQIRPLLIETDKF
LVKLKPGKNSI-TRHSESSVTVPDKQIFGSLDT-----TESKDQC---RCGW
PNYLLVPKGKCGGMEFKLVVATNWADDKLH-D-----DTSC--MC--KGSPA
YCRLLYNQVPDRRPLGYPFDRRISTL--KLEDIHST--VQNLFATDVTIKFTGGGMA--
-----H-----

>AmaHcBII

M-RL-----AAILALCLTQAL-----AS--C-PAPTGDLKAKQ
AQIQNIIEHVNRPLYSDDD-----HAKTD---MDLPGLGVLP
NHEVFSFLFDERQWPEVTKVLKMMMGAA--KDFEDFLRVSDAIRHKINDDMFMFAFTAIVH
RPDTQGLNAPRVQDVYPDKFLTHDVIIKIKEAI-----SRGV---KNPIVNATH--DF
WDIRDQNNKMSYFTEDLGMNANHWHVNPAPIWTN-EL-----GGE-KDRRGEAFYWMH
RQMVARVDAEKLNSKLPRTSSYENWDSPIRSGYAPHLTIDNTGYNMFRPDDVVMPLP-
-ELTKNQMLLWRSRILDSIHKGYYV--ARNG---TKIMLDHD-----PFGIDVVGH
MVESGRLSVNRPYGNLHCYAHVLAGRTVDPYGYEQDNGAMYDVATSARDPMFYSWHKF
IDNIFQEYKDTFTGYTPEEVT--WKDVEIESVSVKGEKS-----
-----EQSNRLTTFWDTNLFKIGKYFSFTGEN-TA
EVRVKHLQHEGFNYKFEISNNGGEAKEAFVHVYLAPKYNEKRKPFPTDEQRQLMIQLDMF
ITKLKPGKNSI-TRHSESSVTIADKQIFAPADT-----LDGKDQC---KCGW
PNYMLLPRGRTEGMVFQLIVAVTNWGEDKQT-D-----DTSC--MC--KGSPS
YCRFTLTKVPNRRPLGYPFDRKITST--SWDEI--K--VQNLTYTDDVVIKFTGDNLT--
-----AQ-----

>CleHcBII

M-KL-----TIAIALCLAQAL-----CDPLC-PAPTGDLKAKQ
AKITDILEHINRPFEPTH-----KVNIND--ERLKGGLGVLP
DHEVFSFLFARQVPEATRALKLLMGA--KTFDEFIDISETVRHLNDDMFLFIFTSAIIH
RKDTQGLNAPRVQDIYPDKFLTQDVITKIKETI-----NRGE---KVAVVNATH--DY

WDRDINNRLSYFTEDLGLNANHYYQWHAVNPAIWKG-AY---MGGV-KERRGEAFYWMH
RQMLARYDAERLSNNLPRTKPFENWDSPIRQGYAPHLTIDRTGYVYMFPRDDVVLNLP-
-ELTKNQMLWKARILNCIHRGSVY--HRNG---TKLDIVHT-----EHGIDTIAS
LVEASFDSVNFNFYGNLHNYAHVLASRIVDPDGKYEQDNGAMYDIATSARDPLFYKWHKF
IDNIFQEYKDTLKTysteEVt--WSDVEIESVSVKGDKS-----
-----DTPNKLTTFWDTDIVHIGKHLSTGES-TA
DVRVKHLQHEGFNYKFDITNKGGEAKEAMVRVFLAPKYNEQRKPFKPNQRQLVIELDKF
VTKLKPGKNPI-TRHSSDSSVTIADKQIFAPVDT-----LDSKDQC----KCGW
PNYLLLPRGKPEGMVFLFVAVTDWAHEKVS-D-----DISC--MC--KGSSS
YCRFLYGKIPDSRPLGYPFDRKITST--SWDEI--K--IQNLYSTEVVIKFTGDNLTP--
-----PQA-----

>CanHcBII

M-KL-----LILAVALFAAQAY-----AK--C-PAPTGDLKLKQ
SQVQKIIEHVNRPYLPDSD-----SSKLD---LSGRGLGYLK
KWQVFSLFDERQWYEAKEVLDLMMSA--KTFEFLDMSDAIRHKVNPDLFLFAFTTAIVH
RPDTQGLNAPRVQDVYPDKFFTKDVIAHIKEAV-----NRGE---KNPVVNDSC--ES
WNIMSDENKLSYFTEDMGMAHYYHWHVTNPAIWTE-KL-----GGM-KDRRGEAFYWMH
RQMVARVYDAERLSNNMHRVEPFEDWEDDIDEGYASHLTIDNTGYHYMFPRDDMHLNDLP-
-ELSKNELKLWKSRIILDSVHKGYVY--AKNQ--TKINIKED-----PFGIDVLAH
IIESSRQTINRPYYGNLHCYAHVIAARIADPDGKYMLDNGVMYDVATSARDPLFYKWHKF
IDNIFQQYKNTLPPYPNEEVN--WSEIKINSVEVEGEVT-----
-----KTPNLLTTFWETDTFKIGKHYSYTAQS-TA
EIVVRHLDHEPFTYKFEVVNNAGDSKEAFVRVYLAPKYNEFGKPFKPNQLRQLVIEMDKF
HMKLKPGKNTV-TRLSSESSVAVPKQIFGPVDT-----LDNKDQC----KCGW
PDYLLLPRGKPEGMPFTLIVYMSNWAEDKIH-D-----DRSC--LC--KGAPS
YCRFLYEKVS DKRP IGYPFDRKVEST--TFDEIEAQ--IQNIYHQDITIKFGNTLLH--
-----RSP-----

>ProHcBII

MMKL-----TQFIIFGLCLALAL-----ADKKC-QDATGDLKLKQ
SLIQKIVDHSVNRPYLPDTE-----APTYDS--PKMKYLGLKP
KTEVFSLFDERQWPEAEFVLKLMMA--TDFDEFLRVSDAIRHRVNNDLFLYTFSVAITH
RPDTKGLMPPRVQDVYPDKFFTHDVIVKIREAA-----NRGE---KNIVVNDTH--DY
WNNLDLHHRLSYFTEDLGLNSHHYHWHVMNPALWSS-KL-----GEV-KERRAELFAWTH
KEMLARYDSERMSMDLPRTRPFEDWDHPIHTGYAPHLTIDRTGYIYSFRPDDMVLKNLP-
-ELTKHQLRLWRGRIILDSIHKHYVY--ARNG---TKISIREE-----PEGTDIVAS
LVESSRESINRPYYGNLHSAHVIAAGQIADPDGKYEQDHGVMYDVAVSARDPLFYKWHKF
INNIFREYKETKTGYTPAEVT--WSGIDIESVKVQGEKT-----
-----TSVPNKITTFWDHSTFKLGKHYTFTGQS-TA
EINVQHLQHEDFSYDIELVNNAGGEKNALVRIFLAPKYDEQHKPLKPNQDQSLAIMLDQY
IAKIKPGKNTL-HRHSSESTVTPDKYIFAPADTL-----DYKEQTC---RCGW
PNYLLVPRGKPEGMTFKLIVYISNYDEEKTD-Y-----DKSC--YC--PGSGS
YCGIVAGKLGKVTPLGYPLDRKIDGL--KWKEI--Q--GPNLYTSDVVIKFGVGNLTP--
-----TC-----

>AmaHcD

M-ML-----KVALCLLVLFVANAYSD-----KLK-C-RTAVPDFKLKQ
RMINHLVDFINKPIYPDFT-----SA-----YGILTQ--KEEMGLGRLS
PDQPFSLFDERHWREAKKVIKLLNA--RDFEEFVKIAELLHERVNDDLLLYGVSVLLH
RNDTQGLHVPPHIIKIYPDKFLRASVIKEMKELS-----KQARLLDETPLIDATE--DH
DNNLDPNHDLTYFLEDLGLNSHHYHWHVMYPALWK-----GDD-LDRKGELFYWMH
KQMLTRYEIARMCNGLERVLFPFENWNEPIEEGYNPHLVIDKLGyrFTYRPPHMLVRNLP-
-NLSKVDLLQWKENIMYAIHRERVI--AENG---TVIPLNND-----HGIEILGD
IVEASALSVNKGTYGNIHNYAHVMAAKITDPYDQFGGNYGAMYDVATSARDPLFYSWHKF
IDNIFQEHNMLPPYTKEQID--FPNVKINKLTIKGDNT-----
-----TEDNIVHTYQDSVVKVPKGFTFTGET-AM
YVKVRHLQHENFKYIEVEN-GGPEKTAVVRIYLAPEENELHQKLRPNEIRQLNVELDKF

TVKLQPGKNVI-LRASDESTLTTPWSHIFKDRYK-----SEPMDC---HCGI
PDYMLLPKGSYSGMPFYVAVHIADWEEDRVD-Q-----VENC--HC--PDYVN
YCGDADRRYPDKRPLGFDFRRVEG---MWDTF--A--TPNMIHQDIQIKFTGEVLAPKS
YYYYPHH-----K-MNV-----

>CleHcD

M-KF-----LLAAVVLALCLASGLAD-----KVQ-C-ITAVPDDFFLKQ
KQINHLVDFLNKPIFPEYT-----SA-----RGTLP--YELVGLGKLA
PDQPFSLFDERQWKETKKVIKYLRA--KDFDEFLHVAELLHERVNDDLLLYGLSVVLLH
RNDTQGLHVPPHKKIYPDKFLKVPVIQKMKSLA-----KKYKYLDETPIVDGTD--EP
GSIDDPNHDHLYFTEDVGLNAHHYHWHVLYPALWK-----GDD-LDRKGEHFYWQH
KQLLARYEVERLANGLSRIRPFENWNLPIEDGYAPHLVIDKLNRYFTYRPPGVTLKNLP-
-TLSKDSMIEWKEALLNAVHLGNVL--LPNG---TKIPLNNE-----HGIEILGD
LVEASRLSKNKELYGNIHNYAHVMAAKVTDYDRFGGNYGVYDVATSARDPLFYSHWK
IDNIFQEHNMLTPYTKEEVE--FPGVKIDKLTIKADNT-----
-----TTDNVIHTFWQESTFKVPKGFTFTPTT-DM
YVKVRHLQHEVFYKELDVSNTGALRNAVVRLFLAPIYDEMHRPFSSNDRRLVIELDKF
TTKLQPGKNTI-IRDSSDNLVTPWSHIFKDKYK-----SQPMDHC---HCGV
PDYLLLPGGDFDGTIFYFAIINDWDHDKVK-Q-----AENC--HC--PDSAN
YCGDADRLYPDTRAVGFDFDRKLRET--KFADY--S--TENFVRTPTIKFTGEILPPKA
YYKDRP-----QHN-----

>ProHcD

M-IK-----GALCLVALLAIGTGWAV-----ELQ-C-HDTVPDFKLKQ
RYINHLVDLINKPIYPGYT-----PI-----QDAFDG--HELKHIGELS
PDKPFSLFDERTWKEAREVIDLLDA--SDFEHFVERANLLHERVNDDFLYCLSVVVLH
RNDTQGVHVPVHKIYPDKFLKLDVINKMKRLA-----KKSRYFNEKPVIDATD--YH
ENHLEPNHDLMYFLEDIGMNSYHYDWHVMYSALWN-----GDD-ISRQGEMFVNMH
KKMVNRYDIERLANGMPRVKPFNAWNEPIEDGFNSHLLIDRIGYRYAFRPPHMLRNL-
-KLSKNQLLVWEQRILNSVHRGIVI--AENG---SYVPLDDH-----DGIDVLAK
MVEASVKSINKGFYGNISYAHVLAGKITDPDRFGGSNGVMFVATSARDPLFYSHWKY
LDKIFQEHHKQLTPYTTEELT--FPSVKITRLLVHGENS-----
-----TEDNVLRTYWQESLLKVKKGFTFTGDM-PI
LVRVTHLQHEDFHYEIDVEN--GGAERRAVVRISLVPLYDETNSLSMEEKRNLAIDLKDF
VVPLKSGVNKI--VRHSNESNLVTPWTHIFDDKYK-----TDPLDHC---HCGW
PDYLMIPKGNIEGMHFGVAVVITDWDEEKVD-Q-----PENC--HC--SERTS
YCGDVVDHLYPDTRAMGFDFDRKLAP--WVENF--G--PDNIDRVTIKVKFTGKTLPPKN
IERLYE-----KERRL-----

>CanHcD

MIRT-----SVLVALLAIGGGWAA-----KLK-C-RDAVPDFHLKQ
RQLNAFVDITNKPIVTDKF-----ST-----KGNIDV--YDLKYLGHLP
KNQPFSLFDARYYKEARQILKLLSDA--KDFDHLHTAEILHGMVNEDMLYCLSVVVLH
RNDTQGLQVPAVHRVYPDKFLKIDVIQKMKELV-----QDGDHLEMPIDTTE--ES
INYKNKHLDLYFLEDIGMNSHHQWHVLYPAIVE-----LDT-LERKGEMFYWMH
KQMLARYDAERFSNGKAPVKPFINWEDPIKGYAPHLRIDKMGYRYAYRPPNMLLKDLK-
-DLDKEDMLTWGERLLKAADLGIAR--ASNG---TIIDLCE-----HGIEIMGD
MVESSLTSINREYYGNLHSAHVMAAGKITDPKDVHSGHYGVYDVPTSARDPLFYAWHKY
INRIFEAHKNRLTPYTREELD--FANVQVKSVMMA-----
-----NKENVIRTYWQESILKVPKGFEFTGQT-TI
GVKVRHLQHEPFNYVIEVEN--GGPPKMAVVRIYGLPNY--WGPHKTFNNMRKYQIELDIF
TTKLESNMNKI--VRAANESNLITPNHVFKDYTE-----SGPMDHC---SCGW
PEYMQIPKGTYAGMPFYVTAVVNDWDQEKVE-Q-----EDNC--HC--KDPVT
YCGDVDRHFYKALGFDFDRKAPVY--TFDEW--A--TPNMRYAKTITFTGKTL----
-----TH-----

>ScoHcX

M-KYCTESLILILAVIGCISAAI-----NFK-C-PK-GTAEKHK
KEIYDLVQRINRPLIPQFK-----EPNFPT-SFLI-----KGKDPK--EFFQAIGHLP

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KKEVFSLSFDERHWDEAMTAYEYLYEA--ETLDDFIDIAKILYLHLNEDMFYYVFSFAVLY
RKDTRNVRLPQVHDVYPDKFLKTDIINKIKQAN-----YQ GK---QHPVIDATK--EF
HDLRNPVSYLHYFLEDIGMNSHHYHWHVMNSALRKA-YP--TE-GEKKFYRKGE LFYHMH
HQMLNRYELERLSNGLPRCPTFENWDDPIAEGYASHLAVDRTGYRYTFRPDNLHVRDLP-
-ELTKDNMRVWRDRIFDAATSCSVL--RENG--SFVKICRTR-----FYGGLNILGN
LIESNLR SINRMFYGNIHCYAHVIAARVTD PDGKYGQGNGVMYDVATSARDPLFYQWHKF
LDHFFYEHLTKLPTNHLFHLQ--NPDVSITNLEIISN-----
-----GRKNEIHTFWENDIMEISKGHSFTLNS-DA
KVKIQLHQHEKFEIHLTVQNDKGEDTDLFVRIFLLPLEDEESHEL SLEEMVRMAVDIEKR
VIPAKPGSNDI-VISS--RSIGAPANKFFGSFEE-----RYISED CNFHSHCGW
PNYLLVPKGSSQGTPFAFVVMLTLAEDDFTP NM-----DDTC--FC--ADSW S
HCGSLFIQYPENVEMGPFQPIIECT--KEEFF--A--LPNIAKQEVI IKFTGETKD SPL
VIQLE-----NDS-----

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Additional Figure A1. Multiple sequence alignment of myriapod hemocyanins and phenoloxidases in FASTA format. See Additional Table A2 for abbreviations of the proteins.