

Supplementary File S4: Phylogenetic reconstructions for the reductase gene family

Aligned amino acid sequences used for the reductase phylogenetic reconstruction:

>Ase_pgFAR

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-----MPV
LTSRED-EKLSVPEFYAGKSIFV-----TGGTGFLGKVFIEKLLYCCPD
IDKIY----MLIREKKNLSIDERMSKFLDDP--LFSRLKEER---PGDL-EKIVLIPGD
ITAPNLGLSAENERILLEKVSVIINSAATVKFNEPLPIAWKINVEGTRMLLALSRRMKR-
IE-----VFIHISTAYSNASSD--RIVV-----DEILYPAPADMMDQVYQLVK--
--DGVTEEETERLLNGLPNTYTFTKALTEHLVAEHQTY--VPTIIRPSV-----
-----VASIK--DEPIRGWLC--NWFGATGISVFTAKGLNRVLLGKASNI
VDVIPVDYVANLVIVAGAKSGG---Q-KSDE-----LKIYNCCSSDCNPVTLKKIHK
EFT-EDTIKNKS--HIMP-LPGWVFTKYKWLLTLLTIIFQMLPMYLADVYRVLTGKIPR
-----YMKLHHLVIQTRLGIDFFTSHSWVMKTDREVLFGLSLS-LAEKHMFPDCP
SSIDWTD--YLQSYCYG---VRRFLEKK----K-----
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>Hsub_pgFAR

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-----MVV
LTSKE--TKPSVAEFYAGKSVFI-----TGGTGFLGKVFIEKLLYSCPD
IGNIY----MLIREKKGLSVSERIKHFLDDP--LFTRLKEKR---PADL-EKIVLIPGD
ITAPDLGITSENEKMLIEKVSVIIIHSAATVKFNEPLPTAWKINVEGTRMMLALSRRMKR-
IE-----VFIHISTAYTN--TN--REVV-----DEILYPAPADIDQVHQYVK--
--DGISEEETEKILNGRPNTYTFTKALTEHLVAENQAY--VPTIIVRPSV-----
-----VAAIK--DEPIKGWLG--NWYGATGLTVFTAKGLNRVIYGHSSNI
VDLIPVDYVANLVIAAGAKS-----S-KSTE-----LKVYNCCSSACNPITIGKLMS
MFA-EDAIKQKS--YAMP-LPGWYIFTKYKWLVLLLTLFQVIPAYITDLYRHLIGKNPR
-----YIKLQSLVNQTRSSIDFFTNSWVMKADRVRELFASLS-PADKYLFPDCP
VNINWRQ--YIQDYCWG---VRHFLEKK----T-----
-----
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>Has_pgFAR

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-----
-----MVV
LTSKE--TKPSVAEFYAGKSVFI-----TGGTGFLGKIFIEKLLYSCPD
IGNIY----MLIREKKGLSVSERIKQFLDDP--LFTRLKEKR---PADL-EKIVLIPGD
ITAPDLGITSENEKMLIEKVSVIIIHSAATVKFNEPLPTAWKINVEGTRMMLALSRRMKR-
IE-----VFIHISTAYTN--TN--REVV-----DEILYPAPADIDQVHQYVK--
--DGISEEETEKILNGRPNTYTFTKALTEHLVAENQAY--VPTIIVRPSV-----
-----VAAIK--DEPIKGWLG--NWYGATGLTVFTAKGLNRVIYGHSSYI
VDLIPVDYVANLVIAAGAKS-----S-KSTE-----LKVYNCCSSACNPITIGKLMS
MFA-EDAIKQKS--YAMP-LPGWYVFTKYKWLVLLLTLFQVIPAYITDLYRHLIGKNPR
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-----YIKLQSLVNQTRSSIDFFTSHSWVMKADRVRELFASLS-PADKYLFPCDP
TDINWTH--YIQDYCWG---VRHFLEKK-----TTNK-----

>Har_pgFAR

-----MVV
LTSKE--TKPSVAEFYAGKSVFI-----TGGTGFLGKVFIEKLLYSCPD
IENIY----MLIREKKGLSVSERIKQFLDDP--LFTRLKDKR---PADL-EKIVLIPGD
ITAPDLGINSENEKMLIEKVSVIIIHSAATVKFNEPLPTAWKINVEGTRMMLALSRRMKR-
IE-----VFIHISTAYTN--TN--REV V-----DEILYPAPADIDQVHQYVK--
--DGISEEDTEKILNGRPNTYTFTKALTEHLVAENQAY--VPTIIVRPSV-----
-----VAAIK--DEPLKGWLG--NWFGATGLTVFTAKGLNRVIYGHSSYI
VDLIPVDYVANLVIAAGAKS-----S-KSTE-----LKVYNCCSSSCNPVTIGTLMS
MFA-DDAIKQKS--YAMP-LPGWYIFTKYKWLVLTLFLFQVIPAYVTDLSRHLIGKSPR
-----YIKLQSLVNQTRSSIDFFTNSHWSVMKADRVRELYASLS-PADKYLFPCDP
TDINWTH--YIQDYCWG---VRHFLEKK-----SYE-----

>Hvi_pgFAR

-----MVV
LTSKE--TKPSVAEFYAGKSVFI-----TGGTGFLGKVFIEKLLYSCPD
IVNIY----MLIREKKGLSVSERIKQFLDDP--LFTRLKDKR---PADL-EKIVLIPGD
ITAPDLGITAANEKMLIEKVSVIIIHSAATVKFNEPLPTAWKINVEGTRMMLALSRRMKR-
IE-----VFIHISTAYTN--TN--REV V-----DEILYPAPADIDQVYQYVK--
--EGISEEDTEKILNGRPNTYTFTKALTEHLVAENQAY--VPTIIVRPSV-----
-----VAAIK--DEPLKGWLG--NWFGATGLTVFTAKGLNRVIYGHSNYI
VDLIPVDYVANLVIAAGAKS-----N-TSSE-----LKVYNCCSSSCNPVKIGTLMS
MFA-DDAIKQKS--YAMP-LPGWYIFTKYKWLVLTLFLFQVIPAYITDLSRHLVGKSPR
-----YIKLQSLVNQTRSSIDFFTNSHWSVMKADRVRELYASLS-PADKYLFPCDP
VNINWTQ--YLQDYCWG---VRNFLEKK-----T-----

>Dpl-ctg3

-----MYPKIAESYDGQSVFM-----TGGTGFLGKVLLEKLLYSCPG
INKVY----LLVREKQNATVQQRIQKLIEP--LFARLREER---PEAL-EKISPIAGD
ISEPKLAIKTEDEQLLAEVSIVFHVAATIKFNEPLDVAMNVNVAGTGRVLNLAQKMKN-
IK-----AFVYVSTAYSN--TD--RKIV-----EEVIYPAPASLNEVKKLLE--
--IGITEEQVKELIKGRPNTYTFTKALAENLVADNHGN--IPAVIIRPSI-----
-----VTSSK--VEPVVGWID--NWFGASALLTTISKGLNRVILSDSENS
LDLIPVDYVSNLTIVAAARC-----E-CSKN-----VTVYNCCTSGNNPIKMGLHAK
LII-ADSKEHKF--NDVP-MPTIH-FTQYKWLVLVLTLLFQTIPAYIADLFLLLTGKKTR
-----YTKVQAKVLFIRDTLEFFTSNNWSIRAPQTIALANSLS-SSDRILFPFNP
TEIVWNE--YIPTYCQG---IRQYLCKK-----

>Ban_wFAR1

-----MYQAIAECYEGQSVFM-----TGGTGFLGKVLLEKLLYSCPG
IEKVY----LLVREKQGATAQQRVQKLLEQP--LFSRIKEEK---PQAF-EKIIPIVGD
ISEPQLGIKAEDEELLAEKVSIVYHVAATIKFNEPFEQAMNVNVAGTGRVLNLSKRMKN-
VK-----AFVYVSTAFSN--TD--RKVI-----EEIYPAPASLNEVKKLLE--
--IGITDAQVKELIRGRPNTYTFTKALAENLVADNHGN--VPAVIIRPSI-----
-----VSSSK--REPMVGWID--NWFGASALITTIMKGLNRVLLSSRDNS
LDLIPVDYVSNIIVAAAKC-----K-CSKN-----VGVYNSSTSGENPLRIGRLAE
LII-ADSNKHKF--YDVP-MPMVY-FTRFKWVLLITLFFQTLPAYIADIFLLIRGKKTR
-----YVKIQSKVSFVRDTLEYFTSNTWSISSRQTTALSQSLS-PSDRYLFPCDP
TDIDWKD--YIPTYCQG--IRQFLCKT-----

>Ban_wFAR2

-----MYRNVNNNYKGHSVYTNGAGSRVKSLSS
ATDNTN-EYQSIAECYKGQSVFI-----TGGTGFGKVLLEKLLYSCPG
IDKVY----LLVRETQGATAHQRMQKLLEP--AFSRIKEEN---PQAF-EKVIPIVGD
ITQPQLGIMAENEELLIKEVSFVYHVAATTKFNETLDIAMNVNVAGTGRVLDLSKRMEN-
IK-----AFVYVSTAYSN--TD--REVV-----EEVLYPAPVSLNEVHKLLK--
--IGITDAQVKELIKGRPNTYTFTKALAENLVADNHGH--VPAIIVRPSI-----
-----VSSSK--KEPITGWID--SWYGATFLATVTMKGFNRFVSSYEYN
LDFIPVDYVSNIIVAAARC-----K-CSDK-----VDVYNSSTSGENPLKIGAFFD
DII-AYSCKHKF--YDIP-LPMAY-LTRYRWVMFLITLLLQTLPAYIADLFLIVGKKPR
-----YVKLASKISAHEVLDYFPSRTWSMSARQTTALFQSLS-PSDRDQFPCDP
TDIDWKE--YIVTYCQG--IRQFLCKS-----

>Ban_GS8R7LM02B1WGH_gene9

-----MSNTFWLFAFLSVVTVYGKRAT
-----~VTIPPEYAAELVTASVGCVRNTGVDPNILDQIVQWNFQETDNVKKFI
YCMSLASG~F~GDSGDGHLIIDKVARLVSDSNKKKDELINALKECNTLSGSDKYDTLFTV
KCNREKQPIVFSF

>Ban_GS8R7LM03D3OA9_gene11

-----MQDKPQVPLIVLNNGRTCPILGLGTWKQLGNVMLRQSAPGDVMRAVKDAIDVG
YRHIDCAFVYGNEKEVGEALKTKFQEGVVKREDMFVTSKLWNTYHRPDLVEGALKASL
AN
LGLEYLDLYLIHWPEAYQEGGDIFPKDAEGKVIPSPVDFVDTWKAMEAQVDKGLVRSIG
L
SNFNKRQTDRVMKAARIKPAVVQIEVNPYINQHKLQHCRLGLAITAYSPLGSPDRPWA
KPGEPHLLDPRLQVIAKRYNKTVAQILIRYADRWLIVIPKTVTRSRLQQNMEVDFQL
SPQDMELLQKLECNGRFCQMDDAHPDYPFHDEY
>Hmel-ctg1

-----MYKSVAECYEGESVFI-----TGGTGFLGKVILEKLLYSCPG
INKVY----LLVRGKANATVQQRIQNILEQP--LFSRLKKEN---PQAL-EKIVPIVGD
ISEPKLGLKAEDEELLNTVSIVFHVAATIKFNEPLEVAVNINVGGTARVLNLCQRVPG-
IK-----AFVYVSTAYSN--TD--RKII-----EEVVYPTPASLSEVKKLIE--
--IGITEDQVQQLIKGRPNTYTFTKALAENVVVENKGR--VPTIIVRPSI-----
-----VSSSK--GEPIVGWID--NWFGASALITTIAGLNRVLLASPLNT
LDLIPVDYVANLIIVAAAKC-----E-CTKE-----VAVLNSCTSGENPIVMRRLAD
LLI-ADSHKHKF--YDVP-MPSVH-FTRFRWVFLMTLVLQTIPAYIADIFLLIRGKRTK
-----YMKIQNRVSLVRNTLEYFTSNNWLICAPKTRALAESLS-SEDKKQFPCNP
RDIDWDL--YIPSYCQG---IRQFLCKS-----

>Hmel-ctg7

---MK-IYQPIADCYEGQSVFI-----TGGTGFLGKVLLEKLLYSCPG
INKIY----ILIREKANVSIEERLQIIFEQP--IFKRIKCEN---PEAL-LKIVPIRGD
VSLPDLGMTVEDKHLLIDTVSRVFHLAATVKFNEPLNIALNINVDGTQHTLSFCKNMKN-
IK-----SFVYVSTAFSN--AD--KKII-----EEKTYPVSKTLSEIKNLID--
--NGLDENLIKELIGGKPNNYAFTKAMAENVIVEGHGN--VPVVIVRPSI-----
-----VSPSI--SEPLSGWID--NWFGATSLIVAAGKGFN RVVHTSADNT
LDLIPVDYVSNAIIVAAAKC-----K-WTKD-----VPVYNSSRRNPLRMQKLGD
LTI-ADSYKNKF--YDIP-LPFVR-FTSSKLIVFLIALFMETIPAYIADFFLLLTGKKCR
-----YVKA VGKLVIIREKLHFFITNSIIQSQKTRNLAESLS-PSDKRIFPFNP
IDIDWDN--YIPIYCHG---IREFLKK-----

>Hmel-ctg2

----MC-EYTPVADFYNGESILI-----TGGTGFLGKVVLEKLLYSCPG
INKIY----ILIREKQNSDGPHRVQGILNQ--IFDRVKNAR---PLAP-VKVIPIVGD
ISEPDLGLSVADDKNIRDNVLSILFHVAANIRFNEPLEIAMNVNLMGTSRTLELFRLEN-
KK-----AFVYVSTAYTN--LD--RKYI-----EEIYPAPFSIKELKTLLD--
--IGIDEDQVKELTKCKLNTYIFTKAMAESLVAQN-CD--LPVTVVRPSI-----
-----ISASI--SEPKPGWID--TWMGASGVMTTIAKGFNRVLLSNPNNF
LDLIPVDYVSNLMIVAAAKG-----I-KTGE-----VAVYNASTSGENPISIKEFMA
LNI-SDSVKNKF--NDFP-KPGVY-YTTKKWIVILITVLLQVLPAYIADLLLFIMRKNTR
-----YVKLQAKVTLARDIVEFFTLNNWRIRATKTCTLAHSLS-PADRNEFPFNP
SDINWKD--YIPLYCYG---IRNFLNV---K-----

>Hmel-ctg4

-----MLRTKYKLCS
ILLRE--KHTSVAECYEGQSAFI-----TGGTGfVgKVLVEKLLYQCPG
IEKIY----LLLREKKNVAPHLRLQQTLEEP--IFSRIRNEK---PEVL-DKIVPIIGD
IAKPELAMRIEDQKLLFEKVTTVFHVAASVSFDDPLDVAMNINVGGLERVFHLCHQMTA
-
LR-----VLLHVSTAYCN--TD--KKVI-----EEIVYPPPASLDKVNDMIA--
--KGINNDQVKMLINKQPNTYAFKAIAETMIVEKRGV--IPTVIVRPTI-----
-----VSASK--NEPFVGWVD--NWFGMTGLMALTLGRNRVLMCKSENV
MDLTPVDYVSNLIIVAAAMKST----S-NDNS-----LSVYNCATSKENPLKAEKVRK
LVV-DYSYKNKI--YDVP-YPYLH-YTTSKWVEWLIITTFNTIPAYLTDTVLLWRGKKPR
-----YINFHISKISMRNVLEFFSSNSWEISASRTRALSASLT-PKDKENFKFDP
IDIDWND--YFPKYCGG---VSRYMLKR---ER-----

>Hmel-ctg5

-----MFRLKQRFSG
VSARF--IHTPVAKCYDGQSVFI-----TGATGFLGKVLLEKILYSCPG
INKVY----LLIRENRESDVHQRIKKILDQP--LFSRLRNDY---PNAI-QKIVPIAGN
ISKPQLGIKNEDIRILQNNVSIVFHSAATVKFDEPLDVSTNVNVNGTQRVNLCHSMKY-
IK-----ALVYVSTAFIN--KY--CDGL-----DEKLYEPPISVTILQEIIK--
--AGVSEDQLQKLLLEGRPNTYTFTKAVAESLVAEQHGN--IPTAIIRPSA-----
-----ITCSK--SEPIAGWLD--NWFAVNTILMMIGNGWIRCLLSKPENV
YDIIPVDYVANLMMVAAVRC-----D-GKNG-----VEVFNCTSSRENPLTTQVFIN
SII-QHSSKHKN--YDFP--PHVY-LTSSKTIWNLITLIFETLPVNVADLYLTVKGKKPR
-----YKKIQNKMNQVRGVLEYFSKHNSLPATRTRALAKNLS-PNDRETFPFDP
RSFNWEE--YMPMYCES---VRKYLLKK-----

>Hmel-ctg6

-----MFRLKQRFSG
VSARF--IHTPVAKCYDGQSVFI-----TGATGFLGKVLLEKILYSCPG

INKVY-----LLIRENQESDVHQRIKKILDQP--LFNRLKNDY---PHAI-QKIVPVAGN
ISKPQLGIKDEDIQILQDKVSIVFHSAATVKFDEPLDVSTNVNVNGTQRVNLCHSMKH-
IK-----ALVHVSTAFIN--KN--SDGL-----DEKLYDSLISVTKLQEMID--
--AGVSEDQLQKLLDGRPNTYTFTKAMAESLVAEQHGN--IPTAIIRPSA-----
-----ITCSK--SEPIVGWLD--NWFVUNAFLMMIGNGWLRCLLSKPEHV
MDIIPVEYVANLMIVA A VRC-----D-GKNG-----VEVFNCTSSRENPLTTQVFIN
SII-QHSSKHKN--YDFP--PHVY-LTSSKTIWNLITLIFETLPVNVADLYLTVKGKQPR
-----YKKIQNKMNQVRGILEDFLKYNWSLPAPRTRALAKSLS-PNDRETFPFDP
RSFNWEE--YMPMYCES---VRKYLLKK-----

>Bmo_swdb1

-MIAHD-SYKSIPDFYAGKTVFI-----TGGTGFLGKVLVEKLVYSCPA
LNKVY-----VLIRETPKQNVLQKLKQLLDSP--IFTRLKNER---PEDL-NKIVPIAGD
LCKPNLGLEPSDEEKLIDEVSVVIHSGATVKFNDALEYAMKINYQGTEQVMRLCRKIKN-
IK-----VFVYISTTYAH--TQ--LDII-----EEVIYPPPARVAEVYETIKRH
G---NNEKNISKILNGQPNTYAFTKALAENLVAENHGD--IPTVVIRPSI-----
-----ITAGI--TEPLEGWVD--TWNGATGIMHLIGKGLCRVLPGNEQNI
LDLIPVDFVCNLALVAAAKCNR-----

-----FFRTQSKLYSIVKTLRCFIFKSWVFKCERVCALNAELS-DLDRAVFNCDP
STIHWEQ--YAQIYFDG---VTKFLEK----PKNLRTDASNN-----

>Dpl-ctg2

-MVPTS-NYTPVSDFYNGKTIFV-----TGGTGFLGKVLIEKLLYSCPG
ISKIY-----MLVREKRNLATDRMKKFFDCP--VFDRLKKEK---PENL-KKLKPVNGD
LSQPCLGIDPKELQVIKDEVTIVFHFAATVKFNEPLSIAMKINVEGTEQVIDLCHSLKK-
IE-----VFVYMSTIFSN--TDDKLNSV-----EERLYRSPKEVDEIYKMIKE-
--NDPREVFNPVLDGRPNTYTFTKAVAENIVAQKRGV--LPTIMIRPSV-----
-----VTPAK--EEPVRGWVA--NWMGPTATLLYLSRGWIRCHYGEDDFT
FEIIPVDYVVNLTIIISAAKFS-----SSNHQVESWPTFCF
FIV-GVIITPSI---DIPFPWIT-FSRSLWFLGIISFFMQLLPAYIADLYLFICGHPTR
-----YVKMLKKYSQNMSALHYFSSRTWYMTANRSQELIDGLS-AEDQKIFPCSP
ASIDWSE--YMATYLHG---VYRFLKLS---HY-----

>Hmel-ctg3

-----MAS
LSNTIP-NNSSISQYYANKSIFI-----TGGTGFLGMILIEKLLYSCPD
IKKIY-----ILIRRKKSVLPEERLKQLINGK--IFDRIRKKC---PDNL-SKIVLVKGD

LIEFDLGLNPKELKMLQDEVSVVFHLAATLKFNEPLSVAMKVNVEGTREVLRVVSQSMK
N-

IE-----IFVYMSTIFSN--ADHERSTI-----VEELYPSPKDINEVYEMINQ-
--NNPNETFCPELLDRRPNTYTFSKAIAENIVAENRGA--LPTIIIRPSV-----
-----VTSCY--NEPMEGWIA--NWMGPTPIFTLVGQGLIRCLYGKTHYT
FEIIPADYVVNLTLCATAKH-----Q-GGKE-----LSIYHSCSTADNPITLAETSE
YVS-KESVKQKF--NLLP-YPGMM-LIENNWLLYLLHFIFHVCPAFIADLLLFIGHPLR
-----YVKLLQKMTYCMKVLKYFSSRSWAMKATNARGLLNSLS-DVDKREFPCDP
VNIKWDE--YFPIYLF--IRKYLLKM----K-----

>Yro_pgFAR

--MVQL-KEDSVAAFYAEKSIFI-----TGGTGFLGKVLIEKLLYSCKA
VDQIY----VLIRKKKDQTPSERIAQLLESE--LFSRLRKDD---PSAL-KKVVPVVG
LTMPNLGLSAAVEDLIVSKVTVFHVAATVKFNERMKNALVNNVEATREVINLCHRLEK
-

VD-----AFIHVSTAYSN--TD--QKV--EERVYPPAPLSEVYAFVKN-
--YGDDMDIIQNLLNGRPNTYTYTKALAEDIVLKEHGG--IPTAIIRPSI-----
-----VLSVL--KEPIGWLD--NWNPTGLLHASSQGVHCSMLGSGSNV
ADLIPVDIVTNLMIVVASRC-----R-KSNG-----LKVYNCSGTTNPITYQAFTK
MFL-DSCISRGW--NKVP-FPLLI-FVKWAFLNRVLKFLLVIVPFFLIDVYLRFFGK-PN
-----YMRMITYTKKAEDLMTFFTSHEWQFKDGNVRDLINMMS-PEDRKIFYCDP
EEIQWKP--YFDDYCVG---VFKYLLKR----KV-----

>Ypa_pgFAR

--MVQL-KEDSVAAFYAEKSIFI-----TGGTGFLGKVLIEKLLYSCKA
VDQFY----VLIRKKKDQTPSERIAQLLESE--LFSRLRKDD---PSAL-KKVVPVVG
LTMPNLGLSAAVEDLIVSKVSVIFHVAATVKFNERMKNALANNVEATREVINLCHRLEK
-

VD-----AFIHVSTAYSN--TD--QKV--EERVYPPAPLSEVYAFVKN-
--YGDDMDIIQNLLNGRPNTYTYTKALAEDIVLKEHGG--IPTAIIRPSI-----
-----VLSVL--KEPIGWLD--NWNPTGLLHASSQGVHCSMLGSGSNV
ADLIPVDIVTNLMIVVASRC-----K-KSNG-----LKVYNCSGTTNPITYQAFTK
MFL-DSCISRGW--NKVP-FPMLI-FVKWAFLNRVLKFLLVIVPFFLIDVYLRFFGK-PN
-----YMRMITYTKKAEDLMTFFTSHEWQFKDGNVRDLINMMS-PEDRKIFYCDP
VEIQWKP--YFDDYCVG---VFKYLLKR----KV-----

>Yev_pgFAR

--MVQL-KEDSVAAFYAEKSIFI-----TGGTGFLGKVLIEKLLYSCKA

VDQIY-----VLIRKKKDQTPSERIAQLLESE--LFSRLRKDD---PSAL-KKVVPVVG
LTMPNLGLSAAVQDLIVSKVSIIFHVAATVKFNERMKNALANNVEATREVINLCHRLEK-
VD-----AFIHVSTAYSN--TD--QKVV-----EERVYPPAPLSEVYAFVTN-
--NGDDMDIIQNLLNGRPNTYTYTKALAEDIVLKEHGG--IPTAIIRPSI-----
-----VLSVL--KEIPGWLD--NWNGPTGLLHASSQGVHCSMLGSGSNV
ADLIPVDIVTNLMIVVASRC-----K-KSNG-----LKVYNCSGTTNPITYQAFTK
MFL-DSCISRGW--NKVP-FPMLL-FVKWAFLNRVLKFFLVIVPFFLIDVYLRFFGK-PN
-----YMRMITYTKKAEDLMTFFTSHEWQFKDGNVRDLINMMS-PEDRKIFYCDP
VEIQWKP--YFDDYCVG---VFKYLLKR----KV-----

>Dpl-ctg1

-----MASCLGG
HFGLNQ-DYIPVADFYADKSIFV-----TGGTGFMGKVLVEKLLRSCPK
IKKIY----LLMRPKRGQDVASRLTELQSP--LFESLRKER---PQEL-NKIVPIVGD
ITEPELGISPADQEMLCQKVSUVFHSAAATVKFDEKLKLSVTINMLGTQQLVQLCHRMLG-
LE-----ALVHVSTAYCN--CE--RERV-----EETVYSPPAQPEHVVTLVQTL
N-DELVDRLITPDVVGDRPNTYTFTKALAEDMLIKECGN--LPVAIVRPSI-----
-----VLSSV--REPVKGWVD--NWNGPNGIIAAVVGKGVFRTMLGNGTRV
ADLVPVDTVINLMIVCAWRTHL---R-RGDG-----VVVYNCCTGQQNPITWQRFVK
TSF-KYMRKHPF--SEVVWYPGGD-ITSSRFQHGILSLLQHRLPAVLIDLVARITGSKPV
-----MVRVQNKLEKASACLEYFTTRQWAFADNNVQALCRSLS-PEDRDTDFDFDV
TNINWDG--YIESYVLG---IRRFLFKE----SPHTLPKSRTIMRRLHIVHVLGQVLAV
LFLWRFVFLRSASLRSVWRSIVELLTRAARMLAVA-----

>Bmo_swdb12

-----MASCVGA
NYSSGS-DYTPVAEFYAEKSVFV-----TGGTGFMGKLFVEKLLRSCPK
IKKIY----LLMRPKRGQDVASRLTELQSP--VFETLRKER---PQEL-NKIVPIVGD
ITEPELGISQTDQMLLCQMVS AIFHSAATVKFDEKLKLSVTINMLGTQQLVQLCHRMLG-
LV-----ALVHVSTAYCN--CE--RERV-----EETVYAPPADPGHVVALVQTL
P-DELVDRLITPHLVVHRPNTYTFTKALAEDMLIKESGN--LPVAIVRPSI-----
-----VLSSV--REPVKGWVD--NWNGPNGIVAAVVGKGIFRTMLGSGDKV
ADLVPVDTVINLMIVCAWRTHL---R-RDQG-----VVVYNCCTGQQNPITWKRFVK
SSF-KYMRKHPF--TEVVWYPGGD-ITSNRLKHNVLTLMQHRAPAVLMDLVSRTTGKNKPM
-----MVRVQNKLEKAAACLEYFTTRQWSFADDNVQALCLLLS-PEDRRTDFDFDV
KNIDWDA--YIESYVLG---IRRFLFKE----SPETLPKSRSLLKRLHIIHILTQVAAV
FFIWRFLFSRSEVLRGLWRRIVDLLTRAARLLAIA-----

>Dpl_FAR3

-----MSLD
DNDLDS-LPDRIAETFAGLTLLV-----TGGTGFMGKVLVEKLLRKCPD
IAKIM----LLVRPKKGKSPKQRLEEMLNDE--LFAKLRSRGGVEPLL-EKLQIVTGD
VSAPDLAISDTDRLDVIENVHIVVHAAATIRFDEELKKAFLNVRGTKLILD LAKQCKK-

LK-----LFIHISTAYCH--LH--EKLL-----EEKPYPPPANPHKIEAMEWM
T-DEAVATITPNLLSKLPNSYAFTKALGEALAVEAMEH--IPVIVLRPSI-----
-----GAGKGVIRTMYSCKSNSY

ADYLPVDVDFINGIMICVWNYIK---L-GDTK-----SNVINFTSSAEIKVTWLEMID
AGREIIMNRVPL--NNVVWYPGGS-MKHSRLYHNICALFFHWIPAIIDTLLFCLGYKPV
-----LMRVHRRISKGFVFEYYTNNQWDFKSDIAQTVRQKLN-PRERRDYKVDA
IGLDISK--YFEDCIRA---ARIFILKE----SDDTLPSARRHMKIMWFVDIVAQFLFW
ALMMYWISGWMASFYSFVVGSSNITPKAIVE-----

>Hmel-ctg10

-----MASEGYS
SSELES-MPDRIAETFTGLHLLV-----TGGTGFMGKVLVEKLLRKCPD
IGKIM----LLVRPKKGKTPKQRLEEMLNDE--LFGKLRALRGGVEPLL-EKLEIVNGD
ASAPDLAISEADRQTIIDNVNIIHAAATIRFDEELKKAVLLNVRGTKLVFELGKKCKN-
LQ-----LFIHISTAYCH--LH--EKLL-----EERPYPADPHKIIDAMEWM
D-EETIATITPKLLSKLPNSYAFTKALGEALAVEAMEH--IPVILRPSI-----
-----VIPIW--QEPLPGWTD--NINGPTGLLIGAGKGVIRTMYSCKSNSY
ADYLPVDVDFINGIMICTWNYIK---N-GDTQ-----RTVVNFTSSAEIKVTWLEMID
AGREIIMKRVPL--NGVVWYPGGS-MKHSRLYHNICALFFHWIPAILIDTLLFCLGYKPV
-----LMRVHRRISKGFDVFEYYTNNQWDFKSDIAQTVRKS LN-PKERRDYKVDA
IGLDILK--YFEDCIKA---ARIYILKE----TDDTLPAARRHMLM-----

>Ban_EST6

-----MSSEGYT
SSELES-MPDRIAETFSGMNLII-----TGGTGFMGKVLVEKLLRKVPD
IGKIM----ILVRPKKGKTPKQRLEEMLNDA--LFEKLRTL RGSIAPLL-EKMQUIIDGD
MSAPDLAISEANRQMIYDEVDMIIHAAATVRFDEELKKAVLLNVRGTKLILEIAKKCKN-
LK-----LFIHISTAYCH--LH--EKLL-----EERPYPADPHKIIDAMEWM
D-DDTIATITPKLLSKLPNSYAFTKALGEALAVEAMEH--IPAVILRPSI-----
-----VIPIW--QEPVPGWTD--NINGPTGLLIGAGKGVIRTMYSCKGNSY
ADYLPVDVDFINGIMIVAWHYL-----

>OnuZ3

-----MSSEGYS
ASEVDA-MTDRIAATYAGLSVVF-----TGGTGFMGKVLIEKLLRKCTE
IRQIY----LLVRPKKGKTPKQRLEELFQGE--LFEQLRNLRGGVEPIL-EKVT LISGD
VSEPD LAMSEADRQLLIENVDIHAAATIRFDEELKKAVLLNVRGTKLIVELAKTCKK-
LK-----LFIHISTAYCH--LH--EKLL-----EEKPYPPADPHQIIQAMEWM
D-EETVAQLTPKLLDKLPNSYAFTKALGEAVVVEAMEADLIPAMILRPSI-----

-----VIPIW--QEPLPGWTD--NINGPTGLLIGAGKGVIRTMYCKSNSY
ADYLPVDVFINGIMISAWNYIT----Y-GDKK-----SRVVNFTSSAEIKVTWLEMID
AGREIIMNRVPL--NGVVWYPGGS-MKHSRLYHNICALFFHWIPAILIDILLFCLGYKPI
-----LMRVHRRISKGFEVFEYYTNNQWDFKSDIAQTVRLRLN-TRERRDYKVDA
VGLDIMK--YFEDCIKA---ARIYILKE----YDDTLPAARRHMRVMYWVDVIAQCLFW
GLILYWISGWFPSITSVFATSDPAPTVMMA-----

>Her_EST1

-----MASEGYS
PSELES-MPDRIAETFTGLHLLV-----TGGTGFMGKVLVEKLLRKCPD
IGKIM----LLVRPKKGKTPKQRLEEMLNDE--LFGKLRLRGGVEPLL-EKLEIVNGD
ASAPDLAISEADRQAIVDNVNIIHAAATIRFDEELKKAVLLNVRGTKLVFELGKKCKN-
LQ-----LFIHISTAYCH--LH--EKLL-----EERPYPPPADPHKIIDAMEWM
D-EETIATITPKLLSKLPNSYAFTKALGKALAVEAMEH--IPVIILRPVY-----
-----WXYHT--GRTVTGLEG--KSNGATGMLMGGCKGFXEAVFRKG---

-----TRNQLDAAKDIGAIAIKTH-----

>Bmo_swdb6

-----MSSEGYS
AEEVDS-MPDRIAASFSNMTVLI-----TGGTGFMGKVLVEKLLRKCD
VKNII----LLVRPKKSKNPKQRLQQMFNGE--LFEQVRNMRGGVQGLL-KKVCLVSGD
ASAPDLAISPEDRQSLVENVDIIHAAATIRFDEELKKAVLLNVRGTKLMVELAKECKK-
LQ-----LFIHISTSCH--LH--EKLL-----EEKPYPPPADPHQVIQAVEWM
D-EETIAAMTPKILNKLPSYAFTKALGEALAVEAMDH--IPVMILRPSI-----
-----VIPIW--QEPIPGWTD--NINGPTGLLIDD----QCVFTQLNL-
--LGPV--MVNLSIKDLRGHIA---R-PDKK-----SSVINFTSSAEIKVTWSEMID
AGREIIMNRVPL--NGVVWYPGGS-MKHSRLYHNICVFFFHWIPAVFIDILLFCLGYKPV
-----LMRVQRRINKGFEVFEYYTNNQWDFKSDIAQTVRQRLN-TRERRDYKVDA
GGLDISK--YFEDCIRA---ARIYILKE----YDDTLPAARRHMKVMWFVDLVTRCLFW
GFVFWLYSWTTSFGSSATTSNVFPAAVVMES-----

>Dpl_FAR4

MQFIGD-MSRSVTEFYDGKCIFV-----TGATGFVGKVLVEKILRSLPG
VKNVY----LLMRQKKGTSGDDRDKDLWNSR--IFDNLRANN--PDAF-NKIKLISGD
LLKEDLGICNDDRGVIQENCNIVFHSAACVRFDQKLKDAVETNTTATLRLKLAEATMKF-
SK-----SQLNPYKIFAS--NF--ICLI-----
-----PPTKHSS-----

>Dpl-ctg6

---MT-PSIGVAEFYKNKTIFV-----TGGTGFLGKVLVEKLLRCCPD
LKRIY----LLMRPKKGLNVNERIDDDYFNCR--VFEIHEKS---PKIF-DKVTVIPGD
ILQHNLGISIEDWEKLQRETEIVFHCAACVRFDMPIRDVNLNTLGTDRVLKLADDMEK-
LE-----VFFVHVSTSYCR--SD--LQKL-----GERLYPAKHRPQDIIDIVKWM
D-DELLTLIQPKLIEPQPNTYSYTKSLSEDLVAQKAGK--YPIVIARPSI-----
-----VTAAE--KEPLPGWVD--NMNGPTGLLVGCCKGVIRTMHCHASYQ
ADAVPVDYVANACVLLGYLTAI---D-KPKE-----IRVCNITQSDQNPITWDEAIN
LGR-VHLHEFPS--SVCLWYPGGS-TKNSKLHHMIASFFFHLLPAYFIDLLMLLMGKKTF
-----MVKVQKRVSYGMKVLEYTTNEWFFENDFYKSLKTRIS-KQDNEVFYTD
STFNWSD--YMRKYMKG---AREYCCKE-----DPSTLPQARKLLNR-----

>Hmel-ctg11

---MA-PSIGVPEYYVGKNIFI-----TGATGFMGKILIEKLLRSCPD
LNKIY----FLMRPKRGQSVKERLDDFINCK--VFDSLHDKS---PKCF-DKLHVISGD
ILQDDLGISIEDWDLQKEIQIVYHCAACVRFDMPIRDVNMNTLGTMKVLKLTGDMKK
-
LE-----VFFVHVSTAYCR--CE--VHTL-----EERLYPANHRPQNVMCEIKWM
D-DDLLSYLQPKLIEPQPNTYAYTKSLTEDLVSHVVGK--YPIVIARPSI-----
-----VIASH--KEPLPGWVD--NMNGPTGLLIGAGKGVIRSMHCNDSYL
ADVVPVDIVVNACILLSFITAM---E-KPKE-----IKICNITQSGYNPITWGEALD
MGR-VHVQEFPF--SVCLWYPGGS-PKSSKVHHLIAAFFFHLLPAYLVDMMCVLMGKKTF
-----MIKIQKRVNYGLEVLQYYTTKEWFFKNDYFRSLPSLVS-KADNETFYTDV
HV-----SVSFLIHK---IS-----

>Dpl-ctg11

---MA-PSIGVAEFYKHKTIFFL-----TGGTGFMGKVLVEKLLRCCPD
LNKIY----LLMRPKKGQSTKERLDDYFNCR--VFDNLQERS---PKCF-DKLAVIPGD
ILQEDLGISIEDWDKLQRETEIVFHCAACVRFDMPIRDVNMNTLGTNKVLKLADGMVN
-
LE-----VFFVHVSTSYCR--CE--VHTL-----EERLYPAKHRPQDVMECVKWM
D-DELLTYLQTKLIEPQPNTYAYTKSLTEDLVSHVVGK--YPIVIARPSI-----
-----VTAAH--KEPLPGWVD--NLNGPTGLLPQKSAGA-----K
GKGKPLQLSLPMKVIM-----PKE-----VRICNVTQSGHNPITWGEALD

MGR-VHVQEFPF--SVCLWYPGGS-AKSSKVQHLLALFFTHLLPAYFVDLLMFLMGKKTF
-----MVKIQKRVSYGLNVLQYYTTKEWFFDNDYYRSLSKRIS-KDDNDVFYTNL
KTINWSA--YIRNYIKG---AREFCCKE-----DPSTLPQARKLQRQLFWLDKAVQVVIY
FLIAYFIYYYYIIRFFVM-----

>OnuZ4

----MA-PSMTVPEYYAGKTLFI-----TGSTGFMGKVLIEKLLRSCPD
IKKIY-----LLMRPKKGHGSKERLDGFMNCR--VFDKLGKSEH---PEQF-HKLQVVPD
ILMEDLGLSVEDRDTLQRECQVLMHCAACVRFDMFIRDAVNMTVGTKRVLDAVSGM
KQ-
IE-----VVFHVSTAYCR--CE--VEVL-----EERLYPAKHRPKHVIETVNW
D-DELLTHLQPKIIEPQPNTYAYTKSLTEDLVAQHAGK--FPIVIARPSI-----
-----VTAAAY--KEPMPGWVD--NLNGPTGLLVGAGKGVIRTMHCNENYA
ADIVPDMVNVNACILLGYTTAL---E-KPKE-----VQFCNIAQSGINGFTWGEALA
LGR-IHVMIEYPF--SICLWYPGGA-PSASRLRHQVTLFLTHTLPAYTVDLLARALQQKPF
-----MVKMQKRIQSGLEVLQYYTTKEWHFRNENLRALRTKVT-EEDDETFTYD
TVIDWNT--YIRDYIKG---AREFVMKE-----DPSTLPQARRLNRQLYYLDTFTKIFIY
SIIASSWMKRSISNILKMFVAA-----

>Bmo_swdb5

----MA-PSASVAEYYAGKSIFI-----TGATGFMGKVLVEKLLKSCPG
LNKLY-----LLMRPKKGQSSKERLDDFLGFK--LFGPLQKEN---PKCF-EKLHVVPD
ILMDDLGISIADRELIQRECQVIFHCAACVSFGPELKKIVKLNTVATKRVLELAKDFNN-
LE-----AFIHVSTSYCR--CE--LDLL-----EEKLYPSPHRPEHIMDCMRWM
D-DKLV AHMQPK-----

-----PQK-----IQICNITQSGLNPITWGEALD
MGR-VHVREYPF--SVCLWYPGGS-PKKTRIQHEIALFFTHLLPAYFVDLLLFLLGKKTF
-----MIKVQKRINYGLEVLQYYTTKKWLFKNDNFLALRTKIS-AEDDRIFYTDI
QEIHWND--YIREYIKG---AREFCDE-----DPSTLPQARRLQKQ-----

>Hmel-ctg12

-----MQPSVTEYYEGKSVLI-----TGATGFVGKTLVEKLLRSCPG
VKTIY-----LLMRKKKGVSQERIRDLCSNI--IFDHLREKQ---PEAF-EKIKLVAGD
ILEEGLGISNDDRQELQKNCNIVYHSAACVRFDQKLKIAIHINTVGTERVLKLAETMEN-
LE-----SFLHLSTAYCR--CD--LPVL-----DEFLYPVHDPNKIMELVEWM
D-DDTLDFLEPRLISSEPNTYSYTKAITEDLVAEYSPK--LPIAIGRPSI-----
-----VTASW--KEPMPGWVD--NLNGPTGLLTASGKGVLRMTMLCNPSYT
ADAVPVDVVVNGCILAYLTAI---D-KPKK-----MPIYNITLSGVQRLTWGEIIE
LGK-HWVLKYPY--TVALWYPGGN-IKSNRLYHYTMVFLTHLIPAYLIDMLLFLLGKRTF

-----MVNVYKRISHGMKVLQFYTTKEWHFRNSNFLSLKNRIN-KNENEIFYTDL
SELNLDA--YLKDYILG---TRKYIVKE-----DESTLPRARKLLKM-----

>Ban_EST4

-----MAPTVAEFYEGKHVFI-----TGATGFVGKALVEKLLRSCPG
IQTIY----LLMRPKKGMSGEDRLKELCNNL--IFDYLRDKQ---PECF-MKVKLIAGD
VLEEELGISNDDRQELQKNCNIVIHSAAACVRFDKNLKDAVHMNTRGTLRVLKLAEATMEK

-
IE-----AFVHLSTAYCR--CQ--LDEL-----EEKLYPAAHDPEKLMDLLEWL
D-DDTLAYLEPKLISSEPNTYSYT-----

>Ban_EST1

----M-TSMGVREFYAGKKIFI-----TGATGFMGKVLVEKLLRSCPD
VETIY----ILVRRKKGQSPEARLEAFAKCG--AFEKLLEQD---AKAF-RKVRLVPGD
IPEDNLGIPDIIIEQELQKECQIVVNNAACVSFNLVVRKAVQMNTMGTQKVLQLAEKMKK-
LE-----VFLHVSTSFCH--DY--IDVL-----EEKIYKAKHNPLDIINMLKWM
D-DDTLAALQPELIKPYPNTYGYTKSLSEDLVSQYSGK--FPIALA-----

>Dpl-ctg17

-----MDLML-----
-----Q--LFEKLLEMN---PKVV-DKIKVINGD
IMEEGLGLSPQHLEELRNECQIVFNNAASVSFNLSLKEAVKTNVMGTQKVLALADTMKK
-
LE-----AFVHVSTSFCH--DH--LKVV-----EEKVYPAPHSPKNVIDIISWM
D-DETLATLEKKLVSPFPNTYGYTKCLTEQLISDHGAT--YPIAIARPSI-----
-----VIPAF--KDPMPGWVD--NVNGPNGIMYAASRGVLHTIYCKQTTK
TDSIPVDMAINGLIILGCLTATE-----

>Dpl-ctg5

-----M-TTDSIREFYKSKNVLV-----TGGTGFMGKVLIEKLLFSVPD
IGNIY-----VLMRPKKGKSVNQRYEDMQRLP--IFDRLRNTK---PSSL-KKIVPLTGD
VLFDDFGLSESDMQKISEDVSIVFHFAATLKLEAPLYENVNMNTCGTQRALNVAKKLKN
-
LR-----LFIHLSTAFCY--PD--YAVL-----EEKMHAPPVKPSDIMHLEWL
D-EKKVAILTPSLLGHPNICYTFSKRLAENIVENEYEN--LPAVVVRPSI-----
-----VCPSI--KEPVPGWVD--SLNGPVGMLMGAGKGVIRSMLCDGSLI
AQVVPVDTCINALIAIGMIEGKRE--D-KAEL-----MPVYNVNIGHQKPTTWGEVLQ
IGK-DYGRKYPL--AWPLWYPNGD-ITTNVYLHEFKRLFYHLLPAYCIDLLFLLRQPRF
-----MVRVQDRISQGLQVLQYFTMRPWTFCPNFDSIQSKLD-KEEQVIFNTDL
TTADRDA--YLQQCIEG---GRIFCLKE----DPSKIRINRAYHNFLFVLDCLVKILFW
LLLLSFFAAAYFTPLRDVLSYGEPVVKYLPFVGRVVCDE-----

>Bmo_swdb8

---MS-SATSVRDFYAGRNILV-----TGGTGFMGKVLVEKLLYSVPE
IGNVY-----ILMRPKKAKTVAQRLEDLQRLP--LFDRLKNER---PNAL-NKIKAIQGD
VLFEDFGLSNLEIENLSKEVTVFHFAATLRLEAPLKDENVNMNTSGTLRTIKVAKKLKN-
LQ-----IFVHLSTAFCY--PD--YEVN-----GEKLYAPPAKPEHVMRLIEWL
D-DRQLTLLTPSLLGHPNICYTFSKRLAENVVEQAYKD--LPIVIARPSI-----
-----VCPSY--SEPMPGWVD--NLNGPVGVMIGAGKGVIRTMCDGTLS
AQVIPVDIAINAIIGMIEGTTK--E-KSLT-----IPVYNVNIGHQKPMTWGDVLT
VAK-DYGRKYPL--SWPLWYPNGD-ITTNVYLHEIRIFYHLVPAYCIDFLLFLMGQKRF

-----LFVVHWVCKILFW
LLILSFVAAAYFEPVRYVLSQGEPPVVKYLPFVASAVFKN-----

>Hmel-ctg9

-----MASEVNEWYRGRKVLV-----TGASGLMGKVLIEKLLYSVPD
IGCVY-----ALVRSKRGKSPESRIEDMWKLP--LFSRIREEK---PHVM-KKLVPVVG
ILFDNLGIEKNQLEEIYNEVSIVFHFAATLRLEAPLKEGLEMNTKGTLRVLEIAKRMKN-
LV-----SFFVHLSTAFCY--PD--HGRM-----AEKVHDPADPHEVLRAASWL
S-EEQLNLLAPSMMQHPNSYTSKRLAEALVKESYAE--IPTVVVRPSI-----
-----VTPAY--KEPTPGWVD--NLNGPIGLMIGAGKGVIRTMHCYGHYH
AEVIPVDIAINAILIPYYINTKI--E-RPAD-----IPVFNLTSGDDRDTTWKEVLD
VGK-ATVRKFPF--EGPLWYPNGN-IRHNKLIHEL CVFFYHIIPAYLIDFLMLIFGQKRF
-----MVRIQNRISVGLEVLQYFTTREWFDTHNFKALATKLN-QMDFATFPMNL

AIIEVGP--YIETCMIG---GKLFCLKE----KLENLPKARLQNNM-----

>Her_EST2

-----MASEVNEWYRGRKVLV-----TGASGLMGKVLIEKLLYSVSD
IGCVY----ALVRSKRGKSPESRIEDMWKLP--LFSRIREEK---PHVM-KKLIPVVG
ILYDNLGIEKNQLEEIYNEVSIVFHFAATLRLEAPLKEGLEMNTKGTLRVLAIAKRMKN-
LV-----SfVHLSTAFcy--PD--HGRM-----AEKVHDPPADPHEVLRAASWL
S-EEQLNLLASSMMQQHPNSYTYSKRLAEALVKESYAE--IPTVVVRPSI-----
-----VTPAY--KEPTPGWVD--NLNGPIGLMIGAGKGVIRTMHCYGHYH
AEVIPVDIAINAILIPYYINTKI--E-RPAD-----IPVFNLTSgDDRDTTWKEVLD
VGK-ATVRKFPF--EGPLWYPNGN-IRHNKLIHELcvFFyHIIPAYLIDFLMLIFGQKRF
-----MVRIQNRIsvGLEVLQYFT-----

>Ban_EST5

-----MASEVNEWYRGRKVLV-----TGASGLMGKVLIEKLLYSVPD
IGCVY----ALVRSKRGKTPESRIEDMWKLP--LFSRIREEK---PHAM-KKLVPVTD
IMYDELGIEKAQLEEIYDEVsIVFHFAASLRLEAPLREGLEMNTKGTLRVLDMAKKMKK-
LV-----SfVHLSTAFcy--PD--YERM-----AEKVHDPPANPHEVLRAASWL
T-DDQLNALAPSLMQLHPNSYTYSKRLAEALVRESYAE--IPTVVVRPSI-----
-----VTPSH--KEPTPGWVD--NLNGPIGLMIGAGKGVIRTMHRYGHYH
AEVIPVDIAINAILIPHYIHTKI--D-RPTE-----IPVFNLTSgDDRDTTWKEVLD
VGK-ATVRKFPF--EGPLWYPN-----

>Bmo_swd7

-----MTSQINewYKGRKvLI-----TGSSGLMGKVLIEKLLYSVPD
IGCVY----ALVRSKRGKSPESRIEDMWKLP--LFTRIREEK---PHVM-KKLVAVPGD
IICDKLGIEKTKLEQIYNEVSvVFHFAASLRLEAPLKEGLEMNTKGTMrvLELSKNIKN-
LV-----AFVHLSTAFcy--PD--YERL-----AEKVHDPPDPENVLQAASWL
T-EQQLNILAPSIYKKHPNSYTYSKRLAEALVKESYPQ--LPAVVVRPSI-----
-----VTPAY--KEPIAGWVD--NLNGPIGLMVGAGKGVIRSMHCYGHYH
AEVIPIDIAINAIIVISYKIGNQS--E-RPPE-----IPTFNLTGDDRNTTWKEVLD
IGK-ATVRKYPF--EGPLWYPNGN-IRHNKFIHDLcvFFyHLVPAYFIDFLMFLFMQKRF
-----MVRIQNRIsvGLEVLQYFTTREWwFDTDNFKALATMLN-PVDKEVFPMDL
SVIEDEP--YIESCMIG---GKLYCMKE----KLENLPKARLQNNILYVLDKITTvFFY

LILLYWVVLVYCAPVREVL SYGGPFVRYLPLVVILKCNCNKCNCCKKRHAESEPKIEAAHF
G

TIHWSLAMIKIKCLIL

>Dpl-ctg9

-----MTFL

EDRDLD-NVPTIPEYYRGKVVFV-----TGGSGFMGKVLIEKLLYSCPD
LEKIY----LLLRPKKGVQPEERLSAIYSSH--CFDRLRNER---PGVFDSKVFFVAGD
VSDIGLGLSEDDRAILLKQTQILFHVAASVRFDDPLKVAVRLNLFGTKQVVDLAKDMKN

-
LE-----SFVHVSTSYAN--TN--REVI-----EEILYPALGDWRETLEICETA
D-DHTLKVLT PKFIGELPNTYVFTKQLAEHV VYEQKGK--MPIVIVRPSI-----
-----VISSH--LEPVPGWID--NFNGPAGLMAASGKGILRTILSSPEIV
SDYIPVDVAIKACIVASWVRGTKKL-E-ATDD-----IPIYNDCVGKLNHMTMQDMVS
VGS-EIAQILPL--KNALWAYGVS-ITTSKFKNLEVL L F H M L P A L L V D M I L W I I G K N P M
-----LVRVQRRITYANMALHYLTKQWTF SNRNLI ALRSKIK-DDDMRDFY YEI
ENIDKYE--FYKQCCFG---GRKYLLKE-----TDDSLEESQAQYKRMVVDLKL VKMTFY
GCLIWWMRREFIRDFIQIIH-----

>Dpl-ctg14

-----FMGKVLIEKLLYSCPD

LEKIY----LLLRPKKGVQPEERLSAIYSSH--CFDRLRNER---PGVFDSKVFFVAGD
VSDTGLGLSEDDRAILLNQTQILFHVAASVRFDDPLKVAVRLNLFGTKQVVDLAKDMK
N-

LE-----SFVHVSTSYAN--TN--REVI-----EEILYPALGDWRETLEICETA
D-DHTLKVLT PKFIGELPNTYVFTKQLAEHV VYEQKGK--MPIVIVRPSI-----
-----VISSH--LEPVPGWID--NFNGPAGLMAASGKGILRTILSSPEIV
SDYIPVDVAIKACIVASWVRGTKKL-E-ATDD-----IPIYNDCVGKLNHMTMQDMVS
VGS-EIAQILPL--KNALWAYGVS-ITTSKFKNLEVL L F H M L P A L L V D M I L W I I G K N P M
-----LVRVQRRITYANMALHYLTKQWTF SNRNLI ALRSKIK-DDDMRHFY YEI
ENIDKYE--FYKQCCFG---GRKYLLKE-----TDDSLEESQAQYKR-----

>Hmel-ctg15

-----MTFL

EDRDFD-DVPTIPEYYRGKTIFL-----TGGSGFMGKVLLEKLLYSCTD
LDRIY----LLLRNKKGVPPPEHRLAAIYKSP--CFDRLRNEK---PGVFDSKVFFIAGD
VSEIGLGLSDDDRTLINRTHIIFHVAASVRFDDHLKAAIKLNLRGTKQILELATEVRN-
LE-----CFTHVSTSYSN--TN--REL V-----EEIMYPPLADWRDTLKICDEL
D-DRVLQVLTA KYIGEMPNTYVFSKQLAEHV VYEYKKGK--LPVVII RPSI-----
-----VVSSV--KDPIPGWIE--NFNGPTGIIVACGKGILRTIYSKPDII
SDYIPVDVAIKCFIASTWSRGTKKL-E-PTDD-----VPIYN SCAGSLNNITVHELIS
IGK-QIIAS MPL--SNMIWCFGAT-ITSSLFIFNVQVFLHLLPAVIDMLLWIFGQKTM
-----LVKIQRRIVANLALHYytiHQWTF SNVNFVTLRSKIK-DKDQEDFY YDL

ENVDRYE--FFRQCCNA---GRKYLLHE-----TEDDIPKNRAHYARYLFLLYDCKHDRF
WVLFPLENIKYLTFSFLRSVSRGKVPR-----

>OnuZ1

-----MGFL
EERNFE-DVPEIPEYYKGKTIFI-----TGGSGFMGKALIEKLLYSCSD
LDRIY----LLLRTKKGVKAEDRLAELYSTG--CFDRLREEK---PDIFSSKV FVVAGD
VMDPGLGLSEEDRALLVNRVNIIFHVAASVRFDPLPFATKLN LGGTKEVVTLAKEVRN-
LS-----ALVHVSTVYSN--TN--RDVI-----EEVMYPPHADWKDTLEVCDVI
D-EHSLRVLTPKYLGDIPNTYTFTKQLAEHV VYEQKGQ--LPAVIIGPSI-----
-----VISSV--EEPVPGWIE--NFNGPVGMLVACGKGIMRSIYTDPNLI
SDYMPVDVSIKSIVTAAWIRGTKKL-E-PPDD-----VQIYNCCAGKLN NITMQELVD
IGK-RLAASLPL--NDTLWNIGGS-ITTSRTIHYIKVLILHCLPAIFVDAILLLGKKPL
-----LLKVQRRRIYIANLALRYITKEWTFDNTNFIQLRSRIK-EQDKKHFYYDI
ENVDKEE--YFRKSCIG--GRKYLLKE----KDEDLPKAKAHHKRMVILDKTVQCIFY
GYLFWVWNTHYIKGLT-DFLYEIFTM-----

>Bmo_swdb3

-----MGLS
EERDMT-HVPTIPEYYKGKSIFI-----TGGSGFIGKIVIEKLLYSCTD
LDRIY----LLMRPKKSVSPDKRLAQLYSTP--CFDRLRKEK---PGVFQSKVLVVPGD
VMEDGLGVSDedrKLLAERVNIVFHSAASVRFDPLKYAVRLNLNGTKEVVELAKSMH
N-
LS-----SFVHVSTSYSN--TN--REVI-----EEVMYPPHADWRDTLEICEKL
D-EHTLRVMTPKYL GELPNTYTFSKQLAEHAVYEQRGQ--LPAVIVRPSI-----
-----VIASA--DEPISGWIE--NFNGPVGIFVACGKGE-----

>Dpl-ctg13

-----MGF
LDRDFR-DVPGIAEYYKDKTIFI-----TGGSGFMGKVLVEKLLYSCPD
LDRIY----LLLSNKGVD AEDRLKNLYSSR--CFDRLRNEK---PDVFDKKVSFIAGD
VGELGLGICDEDRALIINRVHIVFHVAASVRFNDSLKVAARLNLRGTREAVELAKEIRN-
LE-----AFVHVSTSYAN--TN--RQCI-----DEVIYPASGDWRDTLEVIENV
D-EHTLNVLT PKYLDKLPNTYVFTKQLAEHV VNEQKGK--LPIVIMRPSI-----
-----VISSV--REPMVGWIE--NLNGPVAILIASGKGILHTMYTDPNLI
SDYMPVDIAIKAFIAAAWARGTKKL-E-PTDD-----IHLYNCSSEIKALTMGQIVE
LGM-EISKKIPL--DSL VWHPCGG-LTSSKLVNYVKVLLLHLLPALLVDGILKLIGKKPM
-----LTKVQRRRIYVANLAL EYYVTQQWTFKNVNIVKLRSKIK-EEDLKEFFYEM
ETIDIHE--YFMNSCYG--GKLYILKE----KLEDLPAARIHYRRMELLHKVVMIFK

LSVLWFIYNTSFFRDVM-NMLYAVFVG-----

>Hmel-ctg16

-----MGFL
EECDLN-NVPDIPEYYKGKTLLI-----TGGSGFMGKVLIEKLLYSCPD
LDKIY----MLLRSKKGVPEDRLSAIYSSR--CFDRLRRER---SDIFKKKVFFISGD
VSEIGLGISDDDKALIVRTTNIIHFHVAASVRFDDSLKVAANLNLRGTTRELVELAKNMKN-
LE-----VLVHVSTSYAN--TN--RQCI-----DEVIYPAFADWRDTLEICEKL
D-NNTLNLVLTTPKYL GELPNTYVFTKQLAEHVLWEEKGK--LPIIMRPSI-----
-----VISSV--NEPLVGWVE--NLNGPVGMLVASGKGILRTLYTDPDLV
SDYIPVDVAIKAFIAGAWIRGTTKKL-E-PTDD-----IEVYNCSTSHMKTMTIGEIVE
YGRNMIVHEVPL--EGMLWYVGGG-LTTSRLEYNLKVILLHLLPAIFVDLILWISGRKPM
-----LVKLQRRISANLALHYVTQQWTFKNTTS-----

>Bmo_pgFAR

-----MSH
NGTLDE-HYQTVSEFYDGKSVFI-----TGATGFLGKAYVEKLAYSCPG
IVSIY----ILIRNKKGSNTEERMRYLDQP--IFSRIKYEYH---PEYF-KKIIPISGD
IAAPKLGLCDEERNILINEVSIVIHSAASVKLNDHLKFTLNTNVGGTMKVLELVKEMKN-
LA-----MFVYVSTAYSN--TS--QRIL-----EEKLYPQSLNLSEIQKFAEEH
YILGKDDDEMIKFIGNHPNTYAYTKALAENLVAEEHGE--IPTIIIRPSI-----
-----ITASA--EEPVRGFVD--SWSGATAMAASSTLKGWNYIMYSTGEEN
IDLIPLDYVVNLTLVAIAKN-----K-PTKE-----VTVYHVTTSDLNPISIRRFI
KLS-EFASKNPT--SNAAPFAATTLLTKQKPLIKLVTFLMQTTAFLADFWMKTQRKEAK
-----FVKQHNLVVRSDQLEFFPSQSWLLRCERARVLSAGLG-DSGRAVFRCDP
SPIDWDQ--YLPIYFEG--INKHLFKN----KF-----

>Dpl_FAR1

-----TC-N
VKKIY----LLLRPKKGKTAIQRLNQILEDP--VYGILRSEQ--PDFA-SKLIPVEGD
VVDLNLGIEEESRKKIIEVNIIHFHGAATINFEETIKIAALTNIRGTREILNLAKSCKQ-
LK-----GPLNLQLGRKS--LA--LLKLLSLHHGRGTRTVESSRRLDQLVTTEDVE
E-EGTRVQINAKK-----
-----ILSNI-----

>Dpl-ctg7

-----MEIARRIEEKGLEKSLRV
KQALES-GNSEVVTVYDGA VLFI-----TGGSGFIGKQLVEKILRTC-N
VKKIY----LLLRPKKGKTAIQRLNQILEDP--VYGILRSEQ---PDFA-SKLIPVEGD
VVDNLNGIEEESRKKIIEEVNIIFHGAATINFEETIKVAALTNIRGTREILNLAKSCKQ-
LK-----SLVHISTAYAH--AT--RSRI--KTEIKEDFYDSPLPPDALIQLAEDL
E-NEQLEKVIEPLRRDWPNTYTFTKAITEELVRQTATD--LPVCIVRPAI-----
-----VISAY--KEPVPGWVDIKNAYGPSGMVLGVSLGVTHTVHADEDIM
LDFVPVDIVNNALIVA AWTTHQSYI-A-GEKQ-----IKIY-FVTGHRNPIYYRDVFN
VVK-EQARPLVS--PKAIWHSFAV-VTKYKLIYLLLTWLLHYIPGYIIDGVCVMIGEKPQ
-----FIKVYKKVYSVSSVFVYFTNNDWVFLDDNALRLYDQLN-SADKELFTCDM
QQVDMPA--MLMTWFGY---VSKFIKD-----DVTQYEYAVRKQWWLRIANVMFLTLFY
YALYKLVA VTFACLFYFFNLSAGVYQTSV-----

>Dpl-ctg15

-----TC-N
VKKIY----LLLRPKKGKTAIQRLNQILEDP--VYGILRSEQ---PDFA-SKLIPVEGD
VVELNLGMEEESRKKIIEEVNIIFHGAATINFEETIKIAALTNIRGTREILNLAKSCKQ-
LK-----SLVHISTAYAH--AT--RSRI--KTEIKEDFYDSPLPPDALIQLAEDL
E-NEQLEKVIEPLRRDWPNTYTFTKAITEELVRQTATD--LPVCIVRPAI-----
-----VISAY--KEPVPGWVDIKNAYGPSGMVLGVSLGVTHTVHADEDIM
LDFVPVDIVNNALIVA AWTTHQSYI-A-GEKQ-----IKIY-FVTGHRNPIYYRDHQL
HQF-LVARPLVS--PKAIWHSFAV-VTKYKLIYLLLTWLLHYIPGYIIDGVCVMIGEKPQ
-----FIKVYKKVYSVSSVFVYFTNNDWVFLDDNALRLYDQLN-SADKELFTCDM
QQVDMPA--MLMTWFGY---VSKFIKD-----DVTQYEYAVRKQWWLRIANVMFLTLFY
YALYKLVA VTFACLFYFFNLSAGVYQTSV-----

>Dpl_FAR5

-----MANQCGETKTLGIENKHSVGCNM
ETDKEVPMSEVQN FYNGKNVLI-----TGATGFLGKILVEKLLRSCSG
VENLY----LLVRQKRGKDIYTRIEEIFEDP--VFDR LKA EV---PKFR-HKIVVIPAD
CEAAGLGLTISDRQTLIEKVNVVFHSAATVKFDEHLRAALATNVCAPLYLLGLAREIKK-
LE-----VFIHISTAYSN--SH--LSFI-----EEKFYPCEANSGLQKMIDKM
S-DEQINKISPAVLG SWPNTYTFTKALAEKELRENSKN--IPLGIFRPAI-----
-----VTSTL--KEPLKCWLD--NMYGPTGVA VGTATGMLRTVQCDKTVT
ADLVPVDSVNVNCLIVA AYNVHREFVKS-PPQE-----PPIFNYVSSVENRITWGDFTD
LNM-ARIDKHPF--SNAVWYVSLT-LNKSSFVNACVFLHLLPAALVDGLAVCVGKKPQ
-----MLKVYRKIHKFSSVLSYFCTKEIKFCNKRTRELWDNTS-QTDKQIFPFM
AEVSWSS--YFDDYLAG---IRRYLFKE-----SDDTLPRARRKWTRLYYLHQIVRIVFC
LFAIYVICKLMLSHGNLHSLVYGQSLSLKCLVPDVA VRIKHTYINIKRS-----

>Hmel-ctg20

-----VFDRLKEEV---PKFR-HKIVAIPAD
CEAAGLGLTISDRQTLIEKVHVIFHSAATVKFDEHLRAALVINVKAPLYLLQLAKDMKG-
LK-----VFMHISTAYSN--CH--LSHV-----EEKIYPCEANSEKLHSIVDKL
T-DNEVNDILPTILGKWPNTYTFTKALAENEIKLNSKN--VPVAIFRPAI-----
-----VTSTV--KEPLKCWLD--NMYGPTGVAVGTVTGMLRTVQCDPSVT
ADLVPVDSVVNCLMVAARNVSRQYEER-AVIE-----PPIFNYVSSVENRITWGDFT
LNM-ARIDKQPF--SNAVWYASVT-LNKSTFMNQLYIFFLHLLPAALVDALAICIGKKPK
-----MLKVYRKIHKFSSVLMYFCTREITFCNQHTRSLWEKTS-ESDKQIFPFSM
GEVNWDD--YFDSYLPG---IRRYLFKE----SDDTVPQARIKWKRYLLLY-----

>OnuZ5

-----MAPLLDSTPGDDAAFKIPAMAYSNDNDNDASLKTDDNNNDI
DTRNNV-ELTQIQKFYNGKNILI-----TGATGFLGKILVQKLLRCCPG
VENLY----LLVRQKRGKDIYTRIEEIFDDP--VFDRLKEEV---PKFR-HKIVVIPAD
CEAAGLGLTISDRQTLTEKVNIVIFHSAATVKFDEQLRLAFNVNVKASLHVLRRLARDIKG-
LD-----VLMHISTAYSN--SH--LDQV-----EEKFYPCNMDLETNLQTIEKM
T-DEEINSQLSKLLGEYPNTYTMTKALAENELRINSKG--IPLAIFRPAV-----
-----VVSSA--KEPVKCWLD--NMNGPNGIVVGS GTGILRTLQCDMQGT
ADPVPVDMVVNCLMAAAVNVNAAAYAQSNPPPE-----PPIFNYVSSVENKITWGEFMT
LNM-EQVDKYPF--SNAVWYISLR-LTKSWLLNRFYMFLLHLPVAVLMDGLTVCVGKKPK
-----MLKVYKKIHKFSDVLSYFCTKDIEFCNRRQTQELWQKTS-EEDKQLFPFSM
AELDWRD--YFQDYLYG---IRRYLFKE----NDDNLPQARIKWRLYYLHQLVTMLFY
FLALYALWSTFSSFL-----

>Bmo_swdb9

-----MAPVAIEENYIKTNELSTKISRIMEDYKESNYCGDCEHNIYNVNE
DTNQDV-NMSEVQRFYSGKNVLI-----TGGTGFLGKVLIEKLLRSCPG
VENLY----LLVRQKKGKDIYTRIEEIFEDP--VFDRLKTQV---PKFR-HKIVVVPAD
CEAAGLGLTISDRHMLTEKVNIIIFHSAATVKFDEHLRAALTTNVRAPLHLLRLARDMRK
-
LD-----VLMHISTAYSN--SH--LPKI-----EEKFYACEPTCQQLETTISKL
S-DEQINAMLPKILGPWPNTYTFTKALAEKEIRVNANG--VPVGIFRPAI-----
-----VTSTC--KEPLKSWVD--NMYGPTGVAVGSGT-----

-----FPCV-----

>Yev_FARI

-----MSTETVDVANQRNSN
ANMADKKTLAKTTHLSLSNITKIENKLNIFEENLEKSRVCLDCSEKRLADTDQNSNDLEI

TENGRR-SNTDIQEFYNGKSILV-----TGATGFLGKVLVEKLLRCCPG
VENIY-----LLVRQKKGKDIYTRIDDIFDDP--VFERLKREA---PKFR-HKIVAIPGD
CGAAGLGLTLNDRQTLTEKVNIIHSAATVKFDEHLRTALVTNVCAPLHMLRLVRDMK
G-
LD-----VLMHISTAYSN--CH--LSQV-----RERFYPCSVDCDQLSGLVDKF
T-DSEIDSLLPTILGSWPNTYAHT-----
-----ID--NMCGLRGVVVGAATGVLRTLLCDKEVT
AEIVPVDMMVNCLLASARDVHLSYKQSPPPAE-----PPIFNYVSSVEQRITWGGFME
HNV-EQIGWSPL--NSAIWYFCLT-LNTSPLVNTLYEVFLHLPVAVLIDGLALCVGQSPK
-----MLKLYRKIRKFSSVLSYFSTKEIKFCNKRTRELWERTS-EDDKQLFPFSM
AQMDWSK--YFQGYILG---IRKYIFKE----EDDSLPAKRWTRLYYFHQIVRVIFI
LFAVYLVWHIFSSVF-----

>Dpl-ctg16

-----MALSEQTDVKGLK
-IEEKM-EESQIQKAFAGSTILL-----TGGTGFLGKLLVEKLLRSCPD
VKKIY-----LLTRPKKNKDIIKRLQEQQFDDC--LYDKLRKER---PDFI-QKIQVVDGD
VSKIGLGINDEDRKNIINEVEYIFHGAATVRFDEALKTAVLINVRGTREMLVLARACTK-
LR-----ALVHISTAYSN--CP--LKEI-----DEKFYESPLSAEKMIDLVESM
D-DKTLNTITPGILGEFPNTYAYTKFLAEDIVQKNSYG--LPVAVNRPSI-----
-----VVGTA--KEPLLGWID--NVYGPTGVVVGAGVGLIHTLNCDPKAV
ADLVPGDYVVNSVIAAAWKMAARDHP-G-NHEEAPMDQL-
PVIYNYVSSEQPLTWEMFMK
YNE-LYGIETPP--LQAVWAYLLI-LTPNIFYKFCCLLMHWFPAVVDGVCFLIGKKLM

>Hmel-ctg14

-----MEVHTKTDIKSDK
HIMDNI-EDSQIQKTFAGSTIFL-----TGGTGFLGKLMVDKLLRCCPK
IKKLY-----LLTRPKKNKEIMKRLQEQQFDDV--LYDKLRKQM---PDFM-EKIGIIQGD
MGQPDLGISEEDRNKIINEVEFIFHGAATVRFDEALKTAVAINVRGTREILLARSCTK-
LR-----AHVHISTAYSN--CP--LREI-----DEKFYDSNFSGDKLIDLVENI
D-EKTLDSITLGLLGEYPNTYAYTKSAAEDIVQKYSQG--LPVAVFRPSI-----
-----VISTA--HEPVPGWID--NVYGPTGAVVGAAAGLLHVLLCNPSVI
ADLVPGDFVVGCIATAWKTARDYP-G-NHEEAPVDNL-
PMTYNYVSSEQNPLTWEMFMK
YSE-VYGLRVPS--MQAIWMYLLW-LTPSTVMYNFYFLLHWIPAYIIDFFLMIIGKKPI
-----LKKAYVKIKKFSAVIGYFAQREWKFHNGNTLKLYKEMD-ETDKQMFNFDM
ESLVWEE--YFQDYVKG---VRIYLLKD----PLDTIPQSRRKHFKLMLIHYFLLSLIC
FGLFKFVW---FIAKLFI-----

>Hmel-ctg17

-----MEVQTKTDIKSDK
HIMDNI-EDSQIQAMFAGSTIFL-----TGGTGFLGKLMVEKLLRCCPK
IKKLY----LLTRPKKNQEIMTRLQEQFEDV--LYDKLRKQM---PDFM-KKIDLIQGD
MGKPDLDISDEDRNKIINEVEFIFHGAATVRFDEALKTAVAINVRGTREILLARSCTK-
LR-----AHVHISTAYSN--CP--LREI-----DEKFYDSNLPGDKLIDLVENI
N-KETLASITPGLLGEFPNTYSYTKSAAEDIVRKYSQG--LPVAVFRPSI-----
-----VISTA--QEPVPGWID--NVYGPTGVAVGAGVGLLHVLLCNPSAI
ADLVPSDFVVNGCIAIAWKTARDYP-G-NHEEAPEDNL-PIIYNYVSSEQNPMTWELFLK
KCE-VHRARAPL--MQATWMYLFW-LTSSEFMYNIYFVILHWVPAYITDFFLVIIGKKPI
-----LKKTYVKIKKFSAVIAYFAQREWKFHNGNILNLYKEMH-ETDKQMFNFDI
ESFVWEE--YFYEYVKG---IRLFLMKD-----SLDTIPQSRKKHFKLMLIHVLLSLIS
IGLFKFVWCIAIFLCKLFR-----

>Hmel-ctg18

-----MFAGSTIFL-----TGGTGFLGKLMVEKLLRCCPK
IKKLY----LLTRPKKNKEIMTRLQQQFED---LYDKLKKQM---PDFM-EKIDIIQGD
MGKPDLDGISEDRNKIINEVEFIFHGAATVRFDEALKTAVAINVRGTREILLARSCTK-
LR-----AHVHISTAYSN--CP--LREI-----DEKFYDSNLPGDKLIDLVENI
N-EETLASITPGLLGEFPNTYSYTKSAAEDIVRKYSQG--LPVAVFRPSI-----
-----AASSAVFVEPSGTFVY--G-YFKVLVVVGAGVGILHVVLNPSVI
ADMVPGDFVVNGCIATAWKTARDYP-G-NHEDAPVDNL-
PITYNYVSSEQNPMTWKLFMK
YIE-VYGMRVPS--IQAIWMCLCL-ITPYEFIYNFYFLVLHWIPAYITDFFLVIIGKKPI
-----LKKAYAKIKNFSAVIAYFAQREWKFHNGNTLNLYKEMD-ETDKQMFNFDM
ESLIWEE--YMEKYVMG---VRIYLLKD-----PVDTIPQGRKKQFKLMFKLLYITSYFH

>Ban_EST2

MMEDKY-KESQIQKLFGASVLL-----TGGTGFLGKLLVEKLLRSCPD
IKKLY----LLTRPKKNKEIIRLQEQFDDP--LYDKLRKVL---PDFI-EKIGIIEGD
VGQIGLGIGEEDRTTITKEVDFIFHGAATVRFDEALKTAVEINVRGTREMLHLARSCTK-
LR-----AYVHISTAYSN--CP--LKEI-----DEKFYDALLAGDKLIDLVENM
D-VKTLDSITPGLLGEFPNTYAYTKSAAEDIVQKYSKG--LPVAVFRPSI-----
-----VIGTA--RE-----

>Hmel-ctg22

---YT----ILTRPKKNKEIMKRLQEQLDDV--LYDKLRKQM---PNFI-QKISIIQGD
IEQPYLGISEEDRNKIINEVEFIFHGAATVRFDEALKTAVAINVRGTREILLARSCTKT
AH-----AHVHISTAYSN--CP--LTEI-----DEKFYDRNLSGDKLIDLVENL
D-EKTLDSITPGLLGFEFPNTYAYTKSAAEDIVRKYSQG--LPVAVFRPSI-----
-----VISTA--HEPVPGWID--NVYGPTGVVVG-GVGILRVLLCNPSLI
ADLVPGDFVVNGCIATAWKTARDYP---EEGAPVDNL-PITYNYVSSEQNPLTWERFTN
YSE-MNRRKMPL--MQATWMCIFW-LEPSKFLYNFYFVILHWIPAYIIDFFLVIIGKKPI
-----LKKTYVKIKKFSAVSTYFTQREWKFHNGNTLKLKLYKEMN-KTDKQLFNFD
KSLVWED--YFYEYVKG---IRIYLMKD----PLDTIPQSRKKQFKLMLIHIFLLSVIC
FGLFKLVW----FIAKLFISVNPLSFRLQCDFFNRYKGFDDV-----

>Bmo_swdb10

-----MVADIQKYSPKMMPVGEVTGFDAMD
-KLEAL-GESQIGKMFAGTTVLL-----TGGTGFLGKLMVDKLLRCCPD
LKKLF----LLARPKKNKDIKRLQEQLDDV--LYDKLRKER---PNFI-EKICIVEGD
VGAINLGLSQEDRTKIANEVEFIFHGAATVRFDEALKTAVEINVRGTREMCILARSCGK-
LK-----ALVHISTAYSN--CT--VMEI-----EERFYESSLPGDKLIDLVTM
D-EKVINSITPGLLGDFPNTYAYTKSVAEDVVQKYSKG--LPVALFRPSI-----
-----VIGTA--KEPVAGWID--NVYGPTGVVVGAAVGLLHALICKPNAV
ADLVPGDMVVNACIATAWKTAKDYP-G-
NHEDAPPPDLTPPVYNFVSSTQKPLTWSKFMK
YNE-IYGLEVPT--VQAIYYVFM-LTSSRFAYTLYCFFLHWIPAYIIDGVAVLIGKKPM
-----LRKAYTKISKFSEVISYFATREWKFHSGNTEGLVRELC-PADRQTFDFDL
SRLDWSE--YFYNVVRG---VRVYLLKD----PVETVPAGLRRHNILKYSHYIFCAVLT
FVLVRLW----AAWSLLDL-----

>Bmo_swdb14

-----MDSALALEIEQVSRQKAL
EEEALR-GESAVRQFYAGTTALI-----TGGTGFIGKQLIEKLLRSC-D
VKRIY----ILARSKKGLSMEERLQLQFKDP--VYDNLRSQQ---PDFA-QKVIPVEGD
ISELGVGLNDEDRMKLEQEVNVIFHVAATTRFVEPLKKATFINVRGTREILELAKCCKN-
LR-----CFVHVSTAFFN--AT--KSKI---NHTIEEFYESPVPPEVMIQLAETV
E-ECRLNAITADLIRDWPNTYCFTKAIAEDVVRTMGKD--LPVAIVRPPV-----
-----VICTL--NEPTPGWVDMSSVIGPSGIILTILLGVMHVLLMS-DIN
IPLAPLDYVNNAVIAAASEANKRYN-N-NEKE-----IKVYNISCSGCKIETSCLSDL
MNN-PNTQQYAT--PKAVWYCYGF-
ETGSDVFWLSTWLLHYIPAYVADFVFNVTSMKRP
EG----IKSFVKMYEKIYKMSLLYGYFLRNQWNLVDDNTVAMLNQMS-KTDRILFNFDI
SKIDWPR--YMLIWCIG---LRKFIVKD----GLKDSEYGMKKQRWLKIAHISFYTLFF
GVVFSLLYLACRIFMYLCNLNTIAAQTLLKI-----

>Bmo_swdb15

-----MDIALALEIEQVSRQKAL

EEEALR-GESAVRQFYAGTTALI-----TGGTGFIGKQLIEKLLRSC-D
VKRIY-----ILMRSKKGKSMPERLQSQFNEP--VYDNLRSQQ---PDFA-RKVIPVEGD
ISELGVGLNDEDRMKLAQEVNVIFHVAATTRFEEPLKKATFINVRGTREILELAKCKD-
LR-----SFBVHVSTAFSN--AT--KSRI---NHNLEEKIYESPVPPEVMINLAKTV
E-ECRLNAITADLIRDWPNTYCFTKAIAEDVVRTMGKD--LPVVIV-----
-----LLTLMLGVMHVVLTSDIS
IPIVPVDYVNNAVIATASDTNVRYN-K-NEKE-----IKVYNISCSGSKIETSCMSDF
LKN-PNTLEYAT--PKAVWYCYGF-GTGSDVFWLSTWLLHYIPAYVADFVFNVTSMKRP
EG-----IKSFBVKLYEKIYKMSMLYGYFLRNQWNFVDDNTVAMLNQMS-KTDRLFNFDV
AKIDCSR--FMAIWCIG---LRKFILKD-----GLKNSEYAK-----

>Bmo_swdb16

-----MDSALALEIEQVSRQKAL
EEEALR-GESAVRQFYAGTTALI-----TGGTGFIGKQLIEKLLRSC-D
VKRIY-----LLIRSKKGKSMQERLKSQNDP--VYDNLRSQQ---PDFT-RKVIPVEGD
ISELGVGLNNEEDRMKLAQEVNVIFHVAATTRFEEPLKKATFINVRGTREIMELAKCKD-
LR-----SFBVHVSTAFSN--AT--KSRI---NHDLEEKIYESPVPPEVMIQLAETV
E-ECRLNAITADLIRDWPNTYCFTKAIAEDVVRTMGKD--LPVAII-----
-----ILTLLGVMHVVLLMS-DIN
IPLAPLDYVNNAVIAAASEANKRYN-N-NEKE-----IKVYNISCSGCKIETSCLSDL
MNN-PNTQQYVT--PKAVWYCYAF-STGSDVIFWLLTWLLHYIPAYVADFVFNVTSMKRP
EG-----IKSYC-----IAFITGFE-RDDRIRHSVTK
IKPNASHSAYRVARVQHIHTLRLCGVCE-----

>Bmo_swdb17

-----MDSALALEIEQVSRQKAL
EEEALR-GESAVRQFYAGTTALI-----TGGTGFIGKQLIEKLLRSC-D
VKRIY-----ILIRSKKGKLSMEERLQLQFKDP--VYDNLRSQQ---PDFA-RKVIPVEGD
ISELGVGLNDEDRMKLAQEANVIFHVAATTRFEEPLKKATFINVRGTREIMELAKCKN-
LR-----SFBVHVSTAFFN--AT--KSRI---NHTIEEKFYESPVPPEVMIQLAETV
E-ECRLNAITADLIRDWPNTYCFTKAIAEDVVRTMGKA--LPVAIVRPPVGKYSRALLSE
IAKVETYKYVVTGHMFACTL--NEPTPGWLDMSVIGPSGILLTAGLGVTHVVLIG-DIT
IALAPVDYVNNTVLATAWETDKRFK-T-NEKE-----SKIYNISNSRCTLEKIA----

>Hmel-ctg13

-----MNPTAPLLDFSEDHEFVSANHLDDYYSQEDQNDAKEAEKQR
LTKGKA-AKTDIQKFYKDQCIFL-----TGGTGFLGKVIIEKLLRACGE
IDTIY-----VLVRSKKGKDPMTRIHEMLDDF--IFHAAHKIN---PKGJ-HKVVPVIGD

MELPGIGLSDEDRLLVSRVTIINSAAATVKFDEKLSIATGINVKGTKEVIKLAKECKN-
LI-----AITHVSTAFSN--TH--VDFI-----EEKFYESPMSVEAL-EAVSQL
D-DNVIESILPALLGNRPNTYCLTKAVAEEAIRTYGEG--MPICIRPSI-----
-----VISTY--EEPVRGWTD--SVYGPTGLVVGIGTGVLRTMYFDVNKV
ADMVPVDLTVNAIIVSAYQTAMNFKEN-QTSD-----IPIYNFVSGAQNPLKWGEFIK
YNM-KYGMDNPT--IKAVWYYGLT-PTNNFYFFVFLDFFLHYLPALLMDVFSAVTGKRRV
-----MLKFYTKLRKLANIMFYFSTQHWKFSDENVKDMWSSIS-AQDRAVFPFSI
GEISWDY--MAETFLLGKNTIRFSIRNK-----

>OnuZ2

MNHSLEASPLIPTEVTRDKMERWVEAQNKGEKTEVDVYGKPSEKQIKELNIRSLSRELQ
DNLHELENSVRIADVENQAMNPTAKILDYSEDHEFVSANQLDNYAAEDKVDAKEEEK
RR
LTKGKA-GKTDIQQFYKDQCVFL-----TGGTGFLGKVLIEKLLRSCDT
VDTIY----VLIRNKKGKDARVRLHDMLEF--LFHRALDEN---PKG-IHKVVPPIGD
MELPGLGISDEDRRTITSKVSIIINAAATVKFDEKLSVSTGINVRGTKEVLRLAKECRN-
LR-----AITHVSTAFSN--TH--VPYI-----EEKFYDPPMSVEAL-EAVSEI
N-EDLIDAILPTLIGKRPNTYCFTKAVAEEA VRKYGEG--LPICIVRPSI-----
-----VVSTY--EEPVRGWTD--SVYGPTGLVVGTGTGVLRTMYMDLNKV
ADMVPVDLTVNAILASAWHAAKNFKEN-QTSD-----IPIYNFVSGAQNPIKWGKFIE
LNR-KYGIDKPT--TKAVWYYGLN-PTNSYFMFLFYNNFLHYLPALMVDA YCAVTGRRRA
-----MLKLYSKVMKMANILFYFSTRDWRFS DRGVRAMWASLS-EADRAVFPFSM
GDMSWDR--LCETFLIG--LRVYLIKD----DLSTLPEARKKWNRLFYLHQLLKVVTF
ALVLNLAYLVL RPILSLVFGL-----

>Dpl-ctg4

-----MEWLNGNDPKIPNFN----DL
NEPRNL-CEERIADYFQDSIILV-----TGGTG FVGKALLEKLLRSCPG
IDTIY----ILMRPKRGLSVEQRYKELLKNQ--VFDHIRTRW---PDRL-SKLYPITGD
VSAPNLGVSAEQ-
QQLLNKCHTVFHSAATVRFTDPLHAAAALNVQGTASLLQLAEDMPF-
LK-----ALVHVSTAYSN--AP--RSHI-----EERVYAPPYDPESIVRCTKML
P-AETVEVIAESLQGEHPNPYTLTKALAESIVYSHTN---LPVCIVRPSI-----
-----VTAAY--QEPFPGWID--NIYGVGTGIIMEISRGTYRSGYCRERYV
VDLVPVDMVVNSCILA AWRQGS---K-KPGR-----CPVYNVTSGSINPLQWGHFTK
LCV-KWARENPT--K-----
-----MMKLARRFKMAAATGEYFANHEWQFSVSELTALHDEASVASDAGAFSHWP
GHFNWES--YIGSYMLG---IRRFILKD----SIDSLPQARNKLNRLYWVHRLFQVATG
YYLFKFLAGRLR-----

>Ban_EST3

-----MECLNGND--LLSPNFNEIGTE
HFNQAY-PEERIADYFHNSIILV-----TGGTG FVGKALLEKLLRSCPG
INTIY----ILMRPKRGLSVDQRYKELLKNQ--VFDRIKAKW---PERL-SKLYPITGD

VSASN LGVSADQ-QLLKKCHTIFHSAATVKFTEPLHAATTLNVQGTATLLKLAEDMPL-
LK-----ALVHVSTAYSN--AP--RSYI-----EERVYPPPYDPESIVKCTKML
P-AETVNIIAESLQGDHPNPYTLTKSLAESIVYSHTE---LPVCIIRPSI-----
-----VTAAF--QEPFPGWID--NVYGVGTGIIMEISRGTYRSGYCRERYV
VDLVPVDMVVNSCILAAWRQGS---K-KPGH-----CPVYNVTSGSINPLQWGHFTK
LCV-KWARENPT--KYVMWYPNFA-FTESRFVNTFWEVSCT-----
-----FYRLSFMICYSEHRVEKL-----

>Bmo_swdb20

-----MDDITLLTTTDKMEAFQKQMEFLNGNDPNMVNRNQECLPNY
QLLSSC-PAEAVADFYDGSVILV-----TGGTGFVVGKALLEKLLRSCPG
IETVY----ILMRPKRGLTVEQRYKELLKNQ--VFDHIRTRW---PERL-SKLHPITGD
VSVQNLGVSDQ-RELLRRVTTVFHSAATVRFTEPLHVATTLNVQGTASLLKLAEDMPK-
LK-----ALVHVSTAYSN--AP--RSYI-----EERVYPPPHDPDNIVRCTRML
P-PETVEVIADSLQGDHPNPYTLTKALAESIVYSHTE---LPVCIVRPSI-----
-----VTAAAS--QEPYPGWID--NIYGVGTGIIMEISRGTYRSGYCRERYV
VDLVPVDMVVNSCILAAWRQGV---K-----
-----QYVMWYPNFS-FTESRLINTFWETCHVLP AFLYDLLLRAQGRKAI
-----MMKIARRFKMAAATGEYFANNEWQFGVAELQALQGEASSTRDAGQFPFWP
AGFDWDT--YIGAYMSG---IRKFILKD-----TVDSL PYARTKLKRLFWIHKLLQAATG
YYVFRLLAGRLR-----

>Dpl_FAR6

-MGPPD-LFRLSARRHSEYGTFI-----N----LFKVLIERLLSTCPD
VGKLH----LLLRPKKGVAPKRLQQLKSSQ--VFDLIRQNN---PRQL-DKLCIIPGD
VSQPGLAIDAEHLKNL-QDVSIVFHSAATLKFDEALPNAVDQNVLSVTRLMDICDTIPN-
LQ-----ALVHVSTAYSN--SE--LTCV-----EEKVYTPPADLGRLALVEAV
P-KPLLANITPEYIKPKPNTYTFTKAMAEAVRCRTQR--YPVAIFRPTI-----
-----VISSL--RHPFPGWIE--NLNGPSGVIAAAGKGLLHV FVRPDAR
ADLLPVDIAIDTLLAVAWETAV---D-RLPT-----VRVYNC-STNSNPTTWRQFET
ALK-KHLLNYPL--DACLWYPCGS-GVQNR YAHKALEFLLQTIPLHIAEYIIRGLGIKMK
-----LSLITAEQKMRAMNEVLAFFALREWKFNTDNVDKLRARLS-PADAAIYNLDP
KSISWDE--QYYNFIRG---TRKYLLKE-----KDENLDEARKHMNRMYLHKGVIFIM
VLVFRLLVQNKNVRQVVYGT LRLLSLSFAAYKNVIESI-----

>Hmel-ctg19

-----VLIERLLSTCPD
VGR LH----LLMRHKKGEAPEKRLVLKQSQ--VFDILRQSN---PSQL-DKLCIIPGD
VSQPGLGITGSYLKEL-QEVSIVFHSAATLKFDEALPTAVEQNVLSVMRLMDICDTLPN-
LQ-----ALVHVSTAYSN--PE--RNVI-----EEKVYSAPAPLPRLALVDAV

P-PPLMASITSQYIKPKPNTYTFTKAMAEAINTRPNK-TYPIAIFRPTI-----
-----VVCSL--RHPYPGWIE--NLNGPSGVVAAAGKGLLHVFRKPDAR
ADLLPVDIAIDTMLAVAWETAV---D-KIPE-----VRVYNC-STFENPTTWLAFEN
SLQ-KFLPVNPM--DGCMWYPSGF-GVETKYAYKLLEMFLQTIPLHVAEYIIRTLGFKMK
-----LSLITADKKIRAMSGVLAFFALREWHFKTDNVAKLRARLT-PSDSAIYNLDP
KSIE-----

>Ban_EST7

-----M
VARPRSPCGALLPQFYAGRIFI-----TGATGFMGKVLIERLLATXPD
IGRLH-----LLMRQKKGVTPKRLQQLIQSQ--VFDVIRQTN---PSQL-DKLCMIPGD
VSQPELGIPLQCLRQL-QEVSIVFHSAATLKFDELLSTAVEQNVLSIIRVMDLCDTLPN-
IQ-----ALVHVSTAYSN--PE--LNVV-----EEKVYDAPASLPRLLALVEAV
P-TPLLANITPDI-----

>OnuZ6

-----M
VSCKDD-VTAQIPQFYAGRSIFI-----TGATGFMGKVLVERLLTTCPD
VDQLF-----LLMRTKRVDVGPEKRLQQLKESQ--VFDNVRQCS---PAQL-DKLCIVPGD
ITKPQLGMTGESIAQL-RNVSVVFHSAATLKFDEALGLAVDQNVRSVRLMELCDMLPN-
MQ-----AFVYVSTGYSN--AE--LSVV-----EERVYPPAPLEQVLALTEAM
P-EDLMASVTRKYIHPKPNTYTFTKAIAEVAVQQHNSS--YPRAIFRPTI-----
-----VVSAL--RTPFPGWVE--NLNGPTGVIAGVGKGLLHFFSCRRDAR
ADMVPVDIVIDALLAVGWETAI---D-RSSE-----VRVYNC-SSYNNPTTWRTFEA
ALS-RYIREHPM--DQVFWYPYGS-IVENGVAQKCLELLQTMPLHLADYCSRIFGIKTK
-----LSFIMVSNRLQAMNTVLQFFSQREWKFITNNMERLRQRLT-PADAAIFNLDV
KTINWEE--LCTNFIKG---TKKYIFKE-----KAENTPEAKKHLQRMKLLPPWCNLFHF
NPASTTHL-----

>Bmo_swdb18

-----MTIREGSETIYTRLLNMVPR
PVSPYA-REPLIPQFYAGKSIFI-----TGATGFMGKVLVERLLWTCPE
IERIF-----LLMREKKEVSPEKRLAQLKQSQ--VFDVIREYC---PGQL-EKLYLIPGD
TTAPNLGLSVESIGLL-KEVSVVFHSAATLKFDEALNKAVDQNVRSVLSLMDICDGMNP-
IE-----ALVHVSTAYSN--AE--LSTV-----EERVYAAPVPLQQLALADAL
P-DQLAADLTPRLISPKPNTYTFTKALAENAVAERTNR-KYPVAIFRPTI-----
-----VISAL--RHPFPGWIE--NLNGPSGVLVAAGKGLLHFFCCKRSAK

ADMIPVDIAIDTLIAAAWETAV---D-KLDE-----IRVYNC-SSGRNSTTWAQFEM
AIK-KLLIEHPL--DKTYWYPSGA-AVEN-----E
-----LSLITISERLQGMCKVLTFFSMREWDFKSDNVRKLQARLS-PQDALIYNLDP
NTIDWDA--LYVDFVKG---TRKYLLKE-----KDQDIDEAKRHLRKMFIYVHNGFLVFVT
ALLRLSLHAPLVRSLVLGTLRLLFTIVSSTYSRVSS-----

>Yev_FARIII

-----MVAR
RLSGEF-PAPTIPAFYAGKSVFI-----TGATGFMGKVLIERILATCPN
VGCLY----LLMREKKDQSPKRLQLKQSQ--VFDVLRRTQ---PAQL-DKLRSLSGD
TSREQLGMDSNSLQQL-REVSIVFHVAATLKFDEELRKAVEENLRSIMRLLNICDSLPH-
IE-----ALVHVSTAYCM--AE--LAEV-----EERVYTPIVPLPTLEALVDHA
D-EAMRQQLVQLLLGDKNPTYTFTKAMAEHAVVEHKAQ--YPVAIFRPTV-----
-----VISSL--RSPVPGWIE--YLNPGSGVVVGAGKGLLHTFRCTKSAR
ADLLPVDIAIGTMITCAWDVAT---N-RQAT-----PRVYNC-STYENPTTWSDFER
CIR-KEIEQPL--DAPLWYPCAF-IAENKYVHKLVELVLQTGPLHLAEWSARAVGMKPK
-----INLITVSRKLAMSDVLMFFSLREWRFRTEVQRLRDRLS-PQDAIYNLDV
NTIDWRQ--HMKNFMMG---VRKYLLKE-----KDQDIEAAKKHLRKMVWVHTGVKLLL
GLTLRLLLRGPAAQSLA-GALRLLLSLCTAVYSRLLPAA-----

>Bmo_swdb19

-----MFVTDSTLHEGCVLQERGGT
MADMSE-EAPILPRFYAGRSVFI-----TGGTGFMGKYTRVICVVS KPS
LKTCNETARSVPPRPLPGPLCSGRSVGLCVQ---IFEKVRERC---PWQL-DKLRVLPGN
LERPLLGLEPVTIARL-HQVSVVFHNAATLKFDEALRKAVDQNVRLSLVDVCDALPN-
LE-----ALVHVSTAYS N--AE--LSRV-----EERVYAAPVPLQQLLALADAL
P-DQLAADLTPRYIHPKNTYTFTKAMAECVLQERTSR-RYPVAIFRPTI-----
-----VISAD--RHPVPGWIE--NLNGPSGVVVGVGKGLMHVFRACLALR
ADFIPVDVVVDNMIAVAWETGS---E-PCGS-----LRVYNCASG-EHATRLSDFRA
TAV-RVLRSLPL--DSGLSYPLI-VVQNRVYRLLFVLQTAPLHVAECLRQTDGQKAR
YHNVPCVQLKVLVVQQRNRGRLRLVHYTTIVFLVLLSYKLIK-----
-----FLNLFMNN-----

>Dpl-ctg10

-----M-EESQIKAFYSGKNLFI-----TGGTG FVGLCLIEKILRTIPD
VGKIY----LLMRPKKGKEIADRLQEFPANP--VFEHLLQNT--SKDIF-NKLIPISGD
VGVENLGINDNDRQILIDEVNIVIHSAATLDFEENLRPTVKINVLGTRYVMDLCQQIKN-
LK-----VMIHVSSAYVN--SY--LKEV-----DEKVYDRPADPENIINMVNTL
T-NDALNDVERLILKNHPNTYTFTKHLAEHEVKKCEAM--FPISIVRPTM-----
-----IVAAL--KEPVPGWTC--SKVGPQGFLMGAAGVVRRLPLAKENI
ADYIPVDIVVNQLLAAGWNAAR-----QNSG-----LQVYHCSTSTQNPFWSILES
VVN-KILTNYPL--KSAVWYPHLA-FVRSLWLFRLSAIFIHFFPAVLLDMLLRITGGKPI

-----CM-----
--LQWEE--YFVKLHLG---VRRYLNKE----TEKTLAAAKTKNNM-----

>Dpl-ctg12

----M-EESQIKAFYNGKNLFI-----TGGTGFVGLCLIEKILRTIPD
VGKIY----LLMRPKKGKEIADRLQEFPGNP--VFEHLLQNT--SKDIF-NKLVPISGD
VGVENLGINDNDRQILIDEVNIHSAATLDFEENLRPTVKINVLGTRYVMDLCQQIKN-
LK-----VMIHVSSAYVN--SY--LKEV-----DEKVYDRPADPENIINMVNTL
T-DDALNDVERLILKNHPNTYTFTKHLAEHEVKKCEAM--FPISIVRPTM-----
-----IVAAL--KEPVPGWTC--SKVGPQGFLMGAAKGVVRRLPIAKENI
ADYIPVDIVVNQLLAAGWNAAR-----QNSG-----LQVYHCSTSTQNPFWSILES
VVN-KILTNYPL--KSAVWYPHLA-FVRSLWLFRLSAIFIHFFPAVLDMMLLRITGGKPI
-----LFRLHKNVWNSLSRLEVFIFTEWKFNPNRTRELSAMMN-KTDSSELFIDV
SKIYWEE--YFVKLHLG---VRRYLNKE----TEKTLAAAKTKNNILYYVHIIWQVMIL
GLLWVIISWVTGLGLTQTSWVIPPIYLLYSML-----

>Hmel-ctg21

----MS-EESQVRSFYSGKNFFI-----TGGTGFVGLCLIEKILRTIPD
VGKLY----LLIRPKKGKDITSRIQEFKHP--VFEKLLETN--TNDIF-NKLIPISGD
VGTKDLGISEEDRQILIENNVVVHSAATLDFEESLKPTVQINVLGTRQIMELCDQMKN-
LK-----VMIHVSSAYVN--SY--LKEA-----HEKVYDTPADVESVIDLSRKL
S-EQALVDMEKILKEHPNTYTFTKHLAEHEVKKYSEK--FPCTIVRPTM-----
-----IVAASW--KEPVPGWTC--SKVGPQGFLMGAAARGVVRRLPLSKDNV
ADYIPVDVVVNQLLAAGWNAGV-----SGPG-----LTVYHCSSTQKPFKWSMLEN
VVN-KMLQNYPL--KSAVWYPYLD-FVSSLWLFRLSAIFIHFLPAILLDMMLLRITGGKPI
-----LFRLHKNVWNSLSRLETIFSEWKFHNTNTRELNQKLN-KVDKEIYFIDI
QTIVWEQ--YFVNLHLG---VRKYLNHE----SEKTLPAAKNKHSM-----

>Bmo_swdb11

----MT-EESLVRAFYSKGNFFI-----TGGTGFVGLCLIEKILRCIPD
VGKVY----LLMRPKKGKEISQRLEEFKPNL--VFEKLLETN--TTDIF-KKLVPISGD
VGEANLGLSPQDRQLLIENNVVVIHSAATLDFQENLRPTVRINLLGTRQVMGLCKEIKN-
LK-----VMIHVSSAYVN--SY--LTEV-----HEKVYPEPEEVEKVISLVGTL
S-DEALDEIEPKILKDHPNTYTFTKHLAEHEVAKCAEL--FPCTIVRPTM-----
-----IVASW--KEPVPGWTC--SKVGPQGFLMGASKGVVRRLPLAKENI
ADYIPVDVVVNQLLVAGWHAAS-----ARSG-----LTVYHCSSTQKPFKWSMIES
SIN-GMLHKYPL--KSAVWYPHLK-FVPSLWLFRLSAIFVHFFPALLLDMMLRVTGGRPI
-----LIRLHKNVWNSLNRLEKFIFSEWKFHNTNTQQLAKELN-KTDAQTFIDI
SKLYWEE--YFMNLHLG---VRRYLNNE----KEGNLKAARNKDTM-----

>Hmel-ctg8

-----MSHVPSGNSLNNCLYALLYERPLFS
FSENKL-KYRSIKESYSGKSIFL-----TGGTGFLGKVLIEKLLRST-D
VEKIF----VLIREKKGIDSDKRLKQMLNIP--IFEDLKENK---PNAL-NKLVAIGGD
VTKKDLGISPEDEQKIIDNVSLVFHSAATVKFTDPFSNIMNINYEGTKKVLKLSKKIKN-
LE-----TFVYISTAFCQ--GD--RTHI-----NESMYPRFYEEGEVYKFIDAY
G-DNPTEVV--KFLDGKPNTYTLSSKSLCESYIKEEHKP--LSTIVLRPSI-----
-----VTPVY--KGPVPGWVD--SWVAATALFSDVARGLTKVVMYGDKNVI
CDMIPVDYVINLAIVAGARG-----N-KTDD-----ILVFNSSSGTANPITWKEGAD
LYL-EESLKYGK--SELK--PRKVMVLSSPLLMDFLSFTLQTTPAFLADLMLRIKGEQPK
-----YLNMQKRAILLRDILRTFSSISFQIKSQKTEGLYTTLS-EEDKVQFPFDP
KTIVWRK--YMRIFYKG--VQKYMLND----K-----

>Bmo_swd2

-----GLIEKLLYSCVG
IENIY----VLIREKEEESADQRLKKIIDS---VFDRVKKQD---INVL-NKIVTVPGN
ISEKNLGLTTEHLKIIQEKVSVFHVAATVKFNEELSKAMAVNVNGTLEIISLCRRINK-
LESDEHTAYLMALIQVSTAFSN--SD--RKHI-----EEIVYCINNVD FEGLKSLTDFW
S---GDEDDVKRLLGKKPNTYTYTKALAEYVMKYGKD--LPIAIRPSI-----
-----IISAI--KEPSQGWID--SWNGSTGTFGGMSSGVMKVMFGSGSNV
ADLVPLDIVVNLIIVAATKC-----KRSS-----LKVYNCCTGTSPNITYSRAEV
IIR-RATYKYSL--NQLPFPFMV-FTNSRLVYTLLRFILQIVPAFLIDLWSLFNGKKAI
-----QMKIQHRITRTLDMKF FMIN EWHFEDSNTREL FENMS-EEDKNVFNFDL
KSIDWDS--CIENYVVG---RRAYGPPDGEWLPSPMDFSNARGRAKPLPTAQAAAYLLIY
RLGYISFVLTCR-----

>Ola_pgFAR

-----MAANTIE
TDEQFT-YNPIVNFYSGKSVFV-----TGATGFLGTVLVEKLLFSCKG
INNIY----VLIKQTKDLTIEGRVLNYLNSK--AFHRVRNTN---PELM-KKIIPICGN
LEHKNLGISDS DIKTLQEEVSIVFHVA AKLLFKMSLATAVNINTKPTEQLIVICKKMRR-
NP-----IFIYVSSAYS N--VN--KQII-----DEKVYSNGVPLETIYDTLEAE
N----TRLMDMFLDKRPNTYIYSKALAEVVGKEFDE--SAAAIVRPSI-----
-----ILSSI--REPIPGWLT--GSHGFPQLVGAACRGFLLRWHGDGTVV
FDVIPVDHVNLIIAAAWETNERRL-V-GNKG-----VKVYNCCSSLRNPIDVITVMN
TCL-KYRK YFGTERTMSIFTPRYI-MKKNYFIYKLLYFTYHTIPAAIIDAFFWITGRTPM
-----MLKTLNKLGLSSVLEYFTHHQFLFLDSNVRG LLRRMD-DTDRQTFNF DV
TEIEWEM--YLQNFVRG---IANNYDSC-----

>Opa_pgFAR

-----MSANTIE
SDDQLINYNPPIVNFYSGKSVFV-----TGATGFLGTVLVEKLLFSCCKG
INNIY-----VLIKQSKDLTIEGRILNYLNSK--AFHRVRNAN---PEFM-KKIIPICGN
LEENNLGISDSMDKTLQAEVSIVFHVAACKLLFKMSLATAVNINTKPTEQLIAICKKMRR-
NP-----IFIYVSSAYSN--VN--KQII-----DEKLYTTGVPLKTIYDTLETE
N-----TRLIDIFLDKRPNTYIYSKALAEVVGKEFDE--SAAIVRPSI-----
-----ILSSI--REPIPGWLT--GSHGFPQLVGAACRGLLLRWHGDGTVV
FDIIPVDHVNLIIAAAWETNERKL-V-GNKG-----VKVYNCCSSLRNPIDVITVMN
TCL-KYRKYFGTERTMSIFTPRYI-MKKNYFIYKLLYFTYHTIPAAIIDAFFWLTGRTPM
-----MLKTLNKLNLSSVLKYFTHHQFLFLDSNVRGLLGRME-DIDRKTFNFDV
TEIEWEM--YLQNFVRG---IASNYDSC-----

>Ofu_pgFAR

-----MSANTME
TDEQFT-YNPPIVNFYSGKSVFV-----TGATGFLGTVLVEKLLFSCCKG
INNIY-----ILIKRTEDLTIEARILNYLNSK--AFHRVKNTN---PELM-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSIVFHVAACKLIFKMSLTAAVNINTKPTEQLIAICKKMRR-
NP-----IFIYVSSAYSN--VN--EQII-----DEKVYSTGVPLETIYDTLDAK
N-----TRLMDIFLDKRPNTYTYYSKALAEVVVEKEFDE---SAAIVRPSI-----
-----IASSI--REPIPGWLS--GSHGFPRVVEAACKGLLLRWHGDGTVA
FDVIPVDHVNLIIAAAWESNERRL-M-GNKG-----VKVYNCCSGLRNPIDVSTVMN
TCL-KYRKYFGT-RTMSIITPRFI-MKKNYFLYKLLYFTYHTIPAAIIDGFFWLTGQTPM
-----MLNTLHKLRLSSVLEYFTLHQFLFLDSNVRGLLRRME-STDRQTFNFDV
TEIEWEP--YLQNFVRG---IANNYD-----

>OscZ_pgFAR

-----MSANTME
TDEQFT-DNSPIVNFYSGKSVFV-----TGATGFLGTVLVEKLLFSCCKG
INNIY-----ILIKQTEDLTIEARILNYLNSK--AFHRVKNTN---PELM-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSIVFHVAACKLLFKMSLAAAVNINTKSTEQLIAICKKMRR-
NP-----IFIYVSSAYSN--VN--KQII-----DEKVYSTGVPLETIYDTLDAK
N-----TRLVDIFLDKRPNTYTYYSKALAEVLVEKEFDE---SAAIVRPSI-----
-----IASSI--REPIPGWLS--GSHGFPRVVEAACKGLLLRWHGNGTVA
FDIIPVDHVNLIIAAAWESNERRL-I-GNKG-----VKVYNCCSGLRNPIDVSTVMN
TCL-KYRKYFGT-RTMSIITPRFI-MKKNYFLYKLLYFTYHTIPAAIIDGFFWLTGRTPM
-----MLNTLHKLRLSSVLEYFTLRQFLFLDSNVRGLLRRME-GTDRQTFNFDV
TEIEWEP--FLQNCVRG---IANNYD-----

>OnuZ_pgFAR

-----MSANTME
TDEQFT-YNPIVNFYSGKSVFV-----TGATGFLGTVLVEKLLFSCKG
INNIY----ILIKQTEDLTIEARILNYLNSK--AFHRVKNTN---PELM-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSI VFHLAAKLLFKMSLAAAVNINTKSTEQLIAICKKMRR-
NP-----IFIYVSSAYS N--VN--KQII-----DEKVYSTGVPLETIYDTLDAK
N----TRLMDIFLDKRPNTYTYSKALAEVLVENE FDE---SAAIVRPSI-----
-----IASSI--REPIPGWLS--GSHGFPRVVEAACKG LLLRWHGDGTVA
FGIIPVDH VANLIIAAAWESNERRL-I-GNKG-----VKVYNCCSGLRNPIDVSTVMN
TCL-KYRK YFGT-RTMSIITPRFI-MKKNYFLYKLLYFTYHTIPAAIIDGFFWLTGRTPM
-----MLNTLHKLRKLSSVLEYFTLRQFLFLDSNVRG LLRRME-GTDRQTFNFDV
TEIEWEP--FLQNCVRG---IANNYD-----

>Oze_pgFAR

-----MAANTIE
TDEQFT-DNSPIVNFYSGKSVFV-----TGATGFVGTVLVEKLLFSCKG
INNIY----ILIKQTEDLTIEARILNYLNSK--PFHRVKNTN---PELL-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSI VFHVA AKLLFKMNLTA AVNINTKPTEQLIAICKKMRR-
NP-----IFIYVSSAYS N--VN--EQII-----DEKVYSTRVPLETVYDTLDIE
N----TRITDIFLDKRPNTYTYSKALAEVVVEKEFNE---SAAIVRPSI-----
-----ILSSI--REPIPGWLS--GSHGFPRVVGAAACKG LLLRWHGDGTVV
CDVIPVDH VANLSIAVAWESNERRL-M-GNKG-----VKVYNCCSSLRNPIDVSTVLN
TCL-KYRK YFGT-RTMSIFTPRFI-MKKNYFLYKLLYFTYHTIPAAIIDGFFWLTGRTP I
-----MLKTLDKLRKLSSVLEYFTHHQFLFLDSNVRG LLRRME-GTDRQTFNFDV
TEIEWEP--YLQNFVRG---IANNYDNS---M-----

>OscE_pgFAR

-----MSANTME
TDEQFT-YNPIVNFYSGKSVFV-----TGATGFLGTVLVEKLLFSCKG
INNIY----ILIKQTEDLTIEARILNYLNSK--AFHRVKNTN---PELM-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSI VFHVA AKLLFKMSLTAAVNINTKPTEQLIAICKKMRR-
NP-----IFIYVSSAYS N--VN--EQII-----DEKVYNTGVPLETIYDTLDTE
N----TRITDIFLDKRPNTYTYSKALAEVVVEKEFDE---SAAIVRPSI-----
-----IVSSI--REPIPGWLS--GSHGFPRVVGAAACKG LLLRWHGDGTVV
CDLIPVDH VANLIIAAAWESNERRL-M-GNKG-----VKVYNCCSSLRNPIDVITVVK
TCI-KYRK YFGT-RTMSIFTPRFI-MKKNYFIYKLLYFTCHTIPAAIIDGFFWLTGRTP I
-----MLKTLDKLSKISSVLEYFTHHQFIFLDSNVRG LLRRME-GTDRQTFNFDV
TEIEWEP--YLQNFVRG---IANNYDYS---M-----

>OnuE_pgFAR

-----MSANTME
TDEQFT-YNPIVNFYSGKSVFV-----TGATGFLGTVLVEKLLFSCKG

INNIY-----ILIKQTEDLTIEARILNYLNSK--AFHRVKNTN---PELM-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSI VFHVA AKLLFKMSLTAAVNINTKPTEQLIAICKKMRR-
NP-----IFIYVSSAYS N--VN--EQII-----DEKVYNTGVPLETIYDTLDTE
N----TRITDIFLDKRPNTY TYSKALAEVVVEKEFDE---SAAIVRPSI-----
-----IVSSI--REPIPGWLS--GSHGFPRVVGAACKG LLLRWHGDGTVV
CDLIPVDH VANLIIAAAWESNERRL-M-GNKG-----VKVYNCCSSLRNPIDVITVVK
TCI-KYRK YFGT-RTMSIFTPRFI-MKKNYFIYKLLYFTYHTIPAAIIDGFFWLTGRTP I
-----MLKTLDKLGKISSVLEYFTHHQFIFLDSNVRG LLRRME-GTDRQTFNFDV
TEIEWEP--YLQNFVRG---IANNYDYS---M-----

>Oza_pgFAR

-----MSANTVE
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INNIY-----ILIKQTEDLTIEARILNYLNSK--AFHRVKNTN---PELM-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSI FHLAAKLLFKMSLTAAVNINTKPTEQLIAICKKMRR-
NP-----IFIYVSSAYS N--VN--KQII-----DEKVYSTGVPLETIYDTLNTE
N----TRITDILLDKRPNTY TYSKALAEVVVEKEFDE---SAAIVRPSI-----
-----IVSSI--REPIPGWMS--GSHGFPRVVGAACEG LLLRWHGDSTVV
FDVIPVDH VANLIIAAAWESNERRL-M-GNKG-----VKVYNCCSGLRNPIDVSTIMN
TCL-KYRK YFGT-RTLSIFTPRFI-VKKNYFIYKLLYFTYHTIPAAIVDGFFWLTRRTPM
-----MLNTLHKLSKLSSVLEYFTLHQFLFLDSNVRG LLRRME-STD RQTFNFDV
TEIEWEP--YLQNCVRG---IANNCDYS---M-----

>Onr.za_pgFAR

-----MSANTVE
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INNIY-----ILIKQTEDLTIETRILNYLNSK--AFHRVKNTN---PELM-KKIIPICGN
LEDKNLGISDSMDKTLLEEVSI FHLAAKLLFKMSLTAAVNINTKPTEQLIAICKKMRR-
NP-----IFIYVSSAYS N--VN--KQII-----DEKVYSTGVPLETIYDTLDTE
N----TRITDILLDKRPNTY TYSKALAEVVVEKEFDE---SAAIVRPSI-----
-----IVSSI--REPIPGWMS--GSHGFPRVVGAACKG LLLRWHGDSTVV
FDVIPVDH VANLIIAAAWESNERRL-M-GNKG-----VKVYNCCSGLRNPIDVSTIMN
TCL-KYRK YFGT-RTLSIFPRFI-VKKNYFIYKLLYFTYHTIPAAIVDGFFWLTRRTPM
-----MLNTLHKLSKLSSVLEYFTLHQFLFLDSNVRG LLRRME-STD RQTFNFDV
TEIEWEP--YLQNCVRG---IANNCDYS---M-----

>Dpl-ctg8

-----MVKCNRRLLFN RNKSFYNAYS NM RSPSHCVT
EDDLNK-KTSSIVDFYNGKSIFI-----TGGTGFLGKMYIRN ILHRCPG
ICKIY----MLIRPTSKNSVESRLED MIKNSMNLFEGLN-----ENHF-MKLVPIEGD
VTAPNLGIHPDKRLLQE QVSIIVHSAATLDINATLREAYHVN VIGTENLLAVAKDMKK-

LH-----AFLHLSTFYCCMTNE--KNAI-----EEKVYSPPLYVKDVPKTLEKY
G---HMRFPQSLKKNKQNTYIFTKAISEYLVSSTHGD--IPTAIRPSL-----
-----IGCSN--KDPYKGWID--VFNIHSFILTAISNGFLRILNINKNTV
WDFIPVDYVANLMILAATKC-----K-KSTQ-----VDIYNCASSGINPVTILSACS
IFISDFVT-----NKKSSKKIRLLNPFVHLIPAFINDVRYILTGRKAN
-----IKKLLKIKDQIKFFGGHWSKAKSDHVTSLINSLS-DEDRKKFPCDP
SDIDWVE--YFREYSKG---IRNYLSKN-----

