**Table S1.** Protein sequences used for construction of the phylogenetic tree

>SIPAO1

METPRRSSVIIVGAGISGLTAAKVLSENGVDDVVILEAADKIGGRIRKEEFGGVAAELGAGWIAGVGGKQ

SNPVWELALQSNLRTCFSDYSNARYNIYDHSGKIFPSGIAADSYKKAVDSAIQKLRSQEGNHNEDTDDAA

ETPSTPKTPIELAIDFILHDFEMAEVEPISTYVDFGEREFLVADERGYEHLLYKMAENFLFTCEGKIMDS

RLKLNTVVREVQHSRNGVLVTTEDGSLYEANYVILSVSIGVLQSDLISFSPSLPRWKMEAVRNLDVMVYT

KIFLKFPNKFWPCEPEKEFFIYAHERRGYYTFWQHMENAYPGSNMLVVTLTNGESKRVEAQSDQDTLREA

MEVLRNMFGPDIPDATDILVPRWWNNRFQRGSYSNYPIYANHQLVHDIKEPVGRIFFTGEHTSEKFSGYV

HGGYLSGIDTSNALLEKMRRDDGRKNESQAFLLEPLLALTGSLTLTQAETVSSLHKCDIPRQLFLSNSKL

GLPEAIL

>SIPAO2

MDSQHKSNRQLQRAPCFSSAGQRAEASPSVIVIGGGIAGLAAARALYDASFQVVVLESRDRIGGRVHTDY

SFGFPVDLGASWLHGVCKENPLAPLIGRLGLPLYRTSGDNSVLYDHDLESYALFDMDGNQVPQDLVTKVG

ETFESILKETDRIRQEFSEDMSIGRAISMVFDRRPDLRLEGIAHKVLQWYLCRMEGWFAADADSISLKYW

DQEELLPGGHGLMVRGYRPVINTLAKGLDIRLDHRVTQVVRRYNGVKVTVEDGRTFVADAAVVAVPLGVL

KSNRIKFEPRLPEWKEAAINELGVGIENKIILHFEKVFWPNVEFLGVVAQSSYECSYFLNLHKATGHPVL

VYMPAGQLAHDIEKLSDEDAANFAFKQLQRILPNATTPIQHLVSHWGTDVNSLGSYSYDAVGKPHEFYER

LRIPVDNIFFAGEATSMDYPGSVHGAYSTGLMAAEDCRMRVLERYGEVDLFQPVMGEDTPVAVPLLISRM

>SIPAO3

MDSQNKSNRQVQRAPCFSNVRRRNAASPSVIVIGGGFAGLAAARTLYDASFQVVVLESRDRIGGRVHTDY

SFGFPVDLGASWLHGVGNENPLAPLIGKLGLPLYRTSGDNSVLYDHDLESYGLFDMEGNQVPQDLVSKVG

ETFESILKETDLIRKENSEDMSIGCAISMVFERRPDLRLNGLGHKVLQWYLCRMEGWFAADADTISLKCW

DQEELLPGGHGLMVRGYKPVINTLAKGLDIRLGHRVTEIVRRYNGVKVTVEDGSTFVADAAIIAVPLGVL

KSNCIKFEPRLPEWKEAAIKELGVGIENKIILHFQDVFWPNVEFLGVVAESSYECSYFLNLHKATGHSVL

VYMPAGQLARDIGELSDEAAANFAFTQLKRILPNATAPIQYLVSHWGTDINSLGSYSYDTVGKPHDLYEK

LRIPVDNLFFAGEATSADYPGSVHGAYSTGLLAAEDCRMRVLERHGELDIFQPAMDEETLIPILISRM

>SIPAO4

MEIKDDDSGSSNLFDGILPPRLGRLHSSAPSVIVIGGGISGIAAARFLHNASFKVLLLESRDRLGGRIHT

DYSFGCPVDMGASWLHGVCDENPLAPLIRRLGLTLYRTSGDNSVLYDHDLESYMLFDMDGHQVPQNTVVQ

VGEVFKKILSETEKVRNEHSHDLSVLQAISIVLDRHPELRQEGLSHEVLQWYICRMEAWFAADADTISLK

TWDQEQVLTGGHGLMVQGYNPVIKALSKDIDIRLNHRVKRITNGYNKVMVTVKDGRNFIADAAIITVPLG

VLKANLIEFEPKLPEWKQSAIADLGVGNENKIALRFDNVFWPNVELLGVVAPTSYACGYFLNLHKATGHR

VLVYMAAGRLACDLEKLTDESAAEFAMLQLKKMFPDATKPVQYLVSHWGTDPDTLGCYSYDLVGKPTDAY

DRLRAPIGNLFFGGEAVSSDDHQGSVHGAYEAGIMAGETCRRHLIKRHGSLEMVQAVSSREETLEAAVPL

QISRM

>SIPAO5

MELKGNDSGRRHGSSPSVIVIGGGISGVAAACFLHNAYFKVLLLESRDRLGGRIHTDNSFGCPVDMGASW

LHGVCNENPLAPLIRRLGLTLYRTSGDDSVLYDHDLESCMLFDMDGHQVPHKIVAEVGDVFKKILDETEK

VRNENSNDISVLQAISIVLDRHPELRQEGVSHEVLQWYICRMEAWFSADADTISLKTWDQEQVLTGGHGL

MVQGYHPVIEALSKDIDIRLNHRVKAITDGYNKVMVTLEDGRNFVADAAIITVPIGVLKANLIEFKPELP

DWKLSAIADLGVGNENKIALRFDTVFWPNVELLGIVAPTSYACGYFLNLHKATGHQVLVYMAAGRLAYDV

EKLSDKEAANFVMRQLKKMFPDAPEPVQYLVSRWGTDPDSLGCYSYDLVGKPTDIYDKLRAPLGNLFFGG

EAVCMDDHQGSVHGAYSAGIIAAEDCCQHLIKRLGSVQLVSSREEILKSIVPLKISRM

>SIPAO6

MVSKKAKVVIIGAGMAGLTAANKLYTTAGCKDLLDLCVVEGGNRIGGRINTSEFGGDRIELGATWIHGIG

GSPVHEIAQQINSLQSEQPWECMDGLLETEAITIAEDGYVLDSSFVEPISNLFNKLMDISQSKLVTQNEI

PNVMSVGSFLRRGIDAYWDEHVDELEGLDKRRKRSLEQGIFAMFESIQRTYTSANDLEMLDFNAEKEYCM

FPGEEITIAKGYLSVIESLASVLPPGLIQLGRKVTKIEWQPDELLEIENGTNKPPVKLHFVDGSIMYADH

VIVTVSLGVLKQGIREDSGMFNPPLASFKTEAITRLGFGVVNKVFLKLTSIPDGINFPYLQMVFHNESEQ

NPKIPWWMRRTANLCPIYGNSNVLLSWFVGKEALEVESLSDEEIIDGFSKTISSFLINSHSDAESMFKVE

KVLKSQWGNDPLFLGSYSYVAIESSGDDLDAMAEPLPKKITSLHDSNVSPPPLQILFAGEATHRTHYSTT

HGAYFSGIREANRLLQHYHCIDI

>SIPAO7

MVTKKPKVVIIGAGMAGLTAANKLYTSAGCKEFIEVCVVEGGDRIGGRIITSEFVGSRIEMGATWIHGIG

GSPVYKIAQEINSLHSDKPWECMNEFLDEPLTIAEGGYHLNSSLVDPICNLFKKLMDFAQGKPHVQFPSS

NGNLSIGSFLRKGLDAYWGSIKEQEETLGFDNWTRKSLEEGIFAMLENTQRTYTSAGDLETLDFNAESEY

RMFPGKEITIAKGYSTIVESLASVLPDGMIQLGRKVTKIEWQPDDGENCDVIKPVKIHFCDGSIMYADHV

IVTVSLGVLKQGIHNNTGMFSPPLPRFKTEAISRLGFGVVNKLFLQLSPNRDEFPNLQMVFHQSDSKLRH

RRIPWWMRRTASLCPIYGTSNVLLSWFAGKEALEVESLSDEEIIDGFSKVISDLLENSKNKCNGHADSAI

KFDKVLKTKWATDPLFLGSYSYVAVGSSGDDLDSMAEPLPKTNNHDLNSLQLQILFAGEATHRTHYSTTH

GAYFSGLREANRLLQHYKYIDI

>AtPAO4

MDKKKNSFPDNLPEGTISELMQKQNNVQPSVIVIGSGISGLAAARNLSEASFKVTVLESRDRIGGRIHTDYSFGCPVDMGASWLHGVSDENPLAPIIRRLGLTLYRTSGDDSILYDHDLESYGLFDMHGNKIPPQLVTKVGDAFKRILEETEKIRDETANDMSVLQGISIVLDRNPELRQEGMAYEVLQWYLCRMEAWFAVDANLISLKCWDQDECLSGGHGLMVQGYEPVIRTIAKDLDIRLNHRVTKVVRTSNNKVIVAVEGGTNFVADAVIITVPIGVLKANLIQFEPELPQWKTSAISGLGVGNENKIALRFDRAFWPNVEFLGMVAPTSYACGYFLNLHKATGHPVLVYMAAGNLAQDLEKLSDEATANFVMLQLKKMFPDAPDPAQYLVTRWGTDPNTLGCYAYDVVGMPEDLYPRLGEPVDNIFFGGEAVNVEHQGSAHGAFLAGVSASQNCQRYIFERLGAWEKLKLVSLMGNSDILETATVPLQISRM

>AtPAO2

MESRKNSDRQMRRANCFSAGERMKTRSPSVIVIGGGFGGISAARTLQDASFQVMVLESRDRIGGRVHTDYSFGFPVDLGASWLHGVCKENPLAPVIGRLGLPLYRTSGDNSVLYDHDLESYALFDMDGNQVPQELVTQIGVTFERILEEINKVRDEQDADISISQAFSIVFSRKPELRLEGLAHNVLQWYVCRMEGWFAADAETISAKCWDQEELLPGGHGLMVRGYRPVINTLAKGLDIRVGHRVTKIVRRYNGVKVTTENGQTFVADAAVIAVPLGVLKSGTIKFEPKLPEWKQEAINDLGVGIENKIILHFEKVFWPKVEFLGVVAETSYGCSYFLNLHKATGHPVLVYMPAGQLAKDIEKMSDEAAANFAVLQLQRILPDALPPVQYLVSRWGSDVNSMGSYSYDIVGKPHDLYERLRVPVDNLFFAGEATSSSFPGSVHGAYSTGLMAAEDCRMRVLERYGELDLFQPVMGEEGPASVPLLISRL

>AtPAO3

MESGGKTNRQLRKAICVSTDEKMKKKRSPSVIVIGGGMAGISAARTLQDASFQVVVLESRDRIGGRVHTDYSFGFPVDLGASWLHGVCKENPLAAVIGRLGLPLYRTSGDNSVLYDHDLESYALFDKAGNQVSQELVTKVGENFEHILEEICKVRDEQDEDMSIAQAFSIVFKRNPELRLEGLAHNVLQWYLCRMEGWFAADAETISAKCWDQEELLPGGHGLMVRGYRPVINTLSKGLDIRLSHRITKISRRYSGVKVTTEKGDTFVADAAVIALPLGVLKSGMITFEPKLPQWKQEAINDLGVGIENKIILNFDNVFWPNVEFLGVVAETSYGCSYFLNLHKATSHPVLVYMPAGQLARDIEKKSDEAAANFAFSQLQKILPDASSPINYLVSRWGSDINSLGSYSYDIVNKPHDLYERLRVPLDNLFFAGEATSSSYPGSVHGAYSTGVLAAEDCRMRVLERYGELEHEMEEEAPASVPLLISRM

>AtPAO5

MAKKARIVIIGAGMAGLTAANKLYTSSNNTFELSVVEGGSRIGGRINTSEFSSEKIEMGATWIHGIGGSPVYRIAKETGSLVSDEPWECMDSTIDKAKTFAEGGFEIEPSIVESISGLFTALMELAQGKEISQSDADLSRLAHIYETATRVCSKGSSTSVGSFLKSGFDAYWDSISNGGEEGVKGYGKWSRKSLEEAIFTMFSNTQRTYTSADELSTLDFAAESEYQMFPGEEITIAKGYLSVIHHLASVLPQGVIQLNRKVTKIEWQSNEVKLHFSDGSVVFADHVIVTVSLGVLKAGIETDAELFSPPLPDFKSDAIRRLGYGVVNKLFVEMSQRKFPSLQLVFDREDSEFRFVKIPWWMRRTATITPIHSNSKVLLSWFAGKEALELEKLTDEEIKDAVMTTISCLTGKEVKNDTAKPLTNGSLNDDDEAMKITKVLKSKWGSDPLFRGSYSYVAVGSSGDDLDAMAEPLPKINKKVGQVNGHDQAKVHELQVMFAGEATHRTHYSTTHGAYYSGLREANRLLKHYKCNF

>AtPAO1

MSTASVIIIGAGISGISAAKVLVENGVEDVLILEATDRIGGRIHKQNFGDVPVELGAGWIAGVGGKESNPVWELASRFNLRTCFSDYTNARFNIYDRSGKIFPTGIASDSYKKAVDSAILKLKSLEAQCSGQVAEEAPSSPKTPIELAIDFILHDFEMAEVEPISTYVDFGEREFLVADERGYECLLYKMAEEFLVTSHGNILDYRLKLNQVVREVQQSRNGVVVKTEDGSVYEANYVIVSASIGVLQSDLLSFQPLLPRWKTEAIQKCDVMVYTKIFLKFPQCFWPCGPGQEFFIYAHEQRGYFTFWQHMENAYPGSNILVVTLTNEQSKRVEAQSDQETMKEAMSVLRDMFGATIPYATDILVPRWWNNRFQRGSYSNYPMISDNQLLQNIKAPVGRIFFTGEHTSEKFSGYVHGGYLAGIDTSKSLLEEMKQSLLLQPLLAFTESLTLTHQKPNNSQIYTNVKFISGTS

>OsPAO1

MVAKKPRVVVVGAGISGLAAAHRLCGAGGDRFEVAVVEAGDRVG

GRILTSEFAGHRVEMGATWVQGVVGSPVYALARDAGALGEEEGRGLPYERMDGFPDRV

LTVAEGGEVVDADTVAGPIEELYRGMMEAARAGEAGGGGGVEEYLRRGLRAYQAARSA

GGGGGGGKELEEVDEALLAMHINRERTDTSADDLGDLDLTAEGEYRDFPGEHVTIPGG

YSRVVERLAAALPPGTVRLGLRLRRLKWGGTPVRLHFADGAPPLTADHVILTVSLGVL

KASLGNKDTAGVGAAAIAFDPPLPPFKREAVARLGFGVVNKLFMEVEAVAPSEPEDVA

GVQPAAAGFPFLHMAFRGHVSKIPWWMRGTESICPVHAGSTVALAWFAGREAAHLESL

PDDDVIRGAHATLDSFLPAAPRWRVRRIKRSGWATDPLFLGSYSYVAVGSSGDDLDRM

AEPLPRGPDAAADERPPSPRLLFAGEATHRTHYSTTHAAYLSGVREANRLLQHYRGGA

NHTT

>OsPAO2

MDSLPNGPSSPVDMVVDYYLYDYEYAEPPRVTSLQNAVPQRTFS

DFGDDVYFVADKRGYESVVHYLAGQYLNTDDSGNVADPRLQLNKVVREISYSSSGVTV

KTEDGSVYQADYRHGLCQLGSPAERSYTVQATAACKFRVLCPARFSRIASDRCVLHVF

DQKWKILAIYEFDMAVYTKIFVKFPKRFWPEGEGREFFLYASTRRGYYGIWQEFEKQY

PDSNVLLVTVTDKESRRIEQQSDNQTKAEIMEVLRNMFPDQDVPDATDILVPRWWSNR

FYKGTFSNWPIGVNRYEYDQLRAPIERVYFTGEHTSEYYNGYVHGGYLAGIDSAEILI

DCAQNQMCKYHVQGKYD

>OsPAO3

MANNSSYGENVRRKSHTPSAIVIGSGFAGIAAANALRNASFEVV

LLESRDRIGGRIHTDYSFGFPVDLGASWLHGVCEENPLAPIIGRLGLPLYRTSGDDSV

LFDHDLESYALYDTKGHQVPQELVEKIGKVFETILEETGKLREETKEDISIAKAIAIV

MERNPHLRQEGIAHDVLQWYLCRMEGWFATDADAISLQGWDQEVLLPGGHGLMVRGYR

PVINTLAKGLDIRLGHRVVEIVRHRNRVEVTVSSGKTFVADAAVIAVPLGVLKANTIK

FEPRLPEWKEEAIRELSVGVENKIILHFSEVFWPNVEFLGVVSSTTYGCSYFLNLHKA

TGHPVLVYMPAGRLACDIEKLSDEAAAQFAFSQLKKILPNAAEPIHYLVSHWGSDENT

LGSYTFDGVGKPRDLYEKLRIPVDNLFFAGEATSVQYTGTVHGAFSTGLMAAEECRMR

VLERFRELDMLEMCHPAMGEQTATVSVPLLISRL

>OsPAO4

MDPNSLKTGGLLLPTIERQCASPPSVIVIGGGISGVAAARALSN

ASFEVTVLESRDRVGGRVHTDYSFGCPIDMGASWLHGVCNENSLAPLIGYLGLKLYRT

SGDNSVLYDHDLESYALFDKAGHQVSKETVAKVEETFERILDETVKVRDEQEHDMPLL

QAISLVLERHPHLKLQGIDDQVLQWCVCRLEAWFAADADEISLKNWDQEHVLTGGHGL

MVNGYYPIIQALAQGLDIRLNQRVTKIARQFNGVTVTTEDGTSYSADACIITVPLGVL

KANIIKFEPELPSWKSSAIADLGVGIENKIAMHFDTVFWPNVEVLGMVGPTPKACGYF

LNLHKATGNPVLVYMAAGRFAQEVEKLSDKEAVDLVMSHLKKMLPDATEPTKYLVSRW

GSDPNSLGSYSCDLVGKPADVSARFAAPVENLYFAGEAASADHSGSVHGAYSSGIAAA

DECRKRILMQKGIPDLVQVKAYEEMAGVIAPLQICRT

>OsPAO5

MDQPSNGFAAGGLFLRHIDGQNASPPSVIVIGGGISGIAAARAL

SNASFKVTLLESRDRLGGRVHTDYSFGCPIDMGASWLHGVCNENSLAPLIRLLGLRLY

RTSGDNSVLYDHDLESYALFDKDGRQVPQEIVTKVGETFEKILKETVKVRAEHEDDMP

LIQAISIVLDRNPHLKLDGLQYEVLQWCICRLEAWFATDVDNISLKNWDQEHVLTGGH

GLMVHGYDPVIKALAQDLDIHLNHRVTKIIQRYNKTIVCVEDGTSFVADAAIITVPLG

VLKANIIKFEPELPDWKLSSISDLGIGIENKIALRFNSVFWPNVEVLGRVAPTSNACG

YFLNLHKATGHPVLVCMVAGRFAYEFEKLSDEESVNFVMSQLKKMLPGATEPVQYLVS

RWGTDPNSLGSYSCDLVGKPADLYERFCAPVGNLFFAGEAACIDHSGSVHGAYSSGIV

AAEDCRRHLSTQLGISDLFQVGKIIMREEMTEVMVPFQISRL

>OsPAO6

MEENKVSMLLLDGWWHMVLMNVMLINVFLDMGRYNFFGSMEPHR

FVWLKNEWIEKRNVLKVHRYRLFMTLKLNLRSEIRKGKHLTCISAGKRIWEAGIADVL

ILEATDRIGGRMHKQSFAGVNVEIGANWVEGVNGEKKNPIWPIVNSTLKLRSFRSDFD

SLAQNVYKDGGLCDEAYVQKRMDRADEVDKSGENLSATLHPSGRDDMSILSMQRLNDH

LPNGPSSPVDMAVDYFTYDYEFAEPPRVTSLQNTVPLPTFTDFGDDTYFVADQRGYES

VVHHLAGQYLNADKSGNIADARLKLNKVVREISYSSTGVTVKTEDNSTYQADYVMVSA

SLGVLQSDLIQFKPQLPSWKILAIYQFDMAVYTKIFVKFPKKFWPEGAGREFFLYAST

RRGYYGVWQEFEKQYPDANVLLVTVTDEESRRIEQQPDSQTKAEIMEVVRCMFPDEDV

PDATDILVPRWWSDRFFRGSFSNWPIGVSRYEYDQLRAPVGRVYFTGEHTSERYNGYV

HGAYLAGIDSAEILINCAQKKMCKYNVGGKHG

>OsPAO7

MTKPTTMAIFLSIVLLSMAQLPSLVAGTGRPRVIIIGAGISGIS

AGKRLSEAGITDILILEATDHIGGRMHKQRFAGVNVEIGANWVEGVNGEKMNPIWPIV

NSTLKLRNFLSDFDSLAQNVYKDGGLCDAAYVQKRIDLADEADKSGENLSATLHPSGR

DDMSILSMQRLNNHLPNGPSSPVDMVVDYFTYDYEFAEPPRVTSLRNTVPLPTFTDFG

DDNYFVADQRGYEAVVYYLAGQYLEADKSGNIVDARLQLNKVVREISYSSTGVTVKTE

DNSTYQADYVMVSASLGVLQSDLIQFKPQLPSWKILAIYQFDMAVYTKIFVKFPKKFW

PEGAGREFFLYASTRRGYYGVWQEFEKQYPDANVLLVTVTDEESRRIEQQPDSQTKAE

IMEVVRSMFPDEDVPDATDILVPRWWSDRFFQGSFSNWPIGVSRYEHDQLRAPVGRVY

FTGEHTSERYNGYVHGAYLAGIYA

>GmPAO1

MYISNCKQEHEHSKNVNGLPLYIYTSLSLSTILFNSSLSFVIIVGAGVSGISAAKLLAENGVKDLVILEASNCIGGRIRKENFGGVSVELGAGWIVGVGG

KESNPIWELVAEYGLRTCFSDYTNVPYNIYDRSGKIFSSGIAADSYKKAVDSAIRNLTNQEEADRQGNSSKTTEPPSSPLELAIDFILHDFEMAEAVPIS

TFTAFGEREFLVADERGFDYLVYKMAEDFLLTSEGKILDTRLKLNHVVREIEHRGSGVRVITEDDCIYEANYVLVSVSIGVLQSNLVAFHPPLPRWKLEA

IEKCDVTVYTKIFLKFPYQFWPSGPGNEFFIYAHDQRGYYTFWQVPDKQRFLNRKQSQEENHLCYSYQRRALPPPSSQVVLRNSL

>GmPAO2

MDAKELFSTNLIDGTVTSHIKRQCNSPHTVIVIGAGISGIAAARSLHEASFKVIVLESRDRIGGRIYTDYSFGCPVDMGASWLHGVCNENPLAPLIRGLG

LTLYHTGGDNSVIYDHDLESCMLFNIDGHQVPQHIMIEVGDTYKRILAEIVKVRNEHPDDMPILQAISIVLNKHPELRLQGLAHEVLQWYICRMEAWFAS

DADIIPLKTWDQEHVLTGGHGLMVKGYDPVVKALANDLDIRLNHRVTKISNGYNMVMVTVEDGRNFVADAVIVTVPIGILKANLIEFTPKLPDWKASAIN

DIGMGNENKIALRFDRVFWPNVEVLGIVAPTSYACGYFLNLHKATGHPILVYMAAGRFAYDLEKLSDESAANFVMQQLKKMFPDASKPVQYLVSRWGTDP

NSLGCYACDLVGMPDDVYERLRAPLGNLFFGGEAVSMDDHQGYVHGAYSSGLMAAENCQRHLLQKQGHMENLPLVPSVRHEMFETTIPLQISRI

>GmPAO3

MAEPPSPPPPPPPQSVSPENDVAMSPHNLDLQNSSEDPDSSFPTQTTPEPAVPDSPDSTTTRPDPNPPPRKRRRRKKFFTELTTGTSTRRNDVAKDCDVE

ALIAISVGFPVDSLTEEEIEANVVSTVGGSEQSNYIVVRNHILARWRSNVSVWLTHDQALRSIRSEHKGLVETAYRFLLEHGYINFGLAHEIKTLKQKPF

DGSYRGTVIVIGAGFAGLVAARQLVFMGFKVVILEGRTRPGGRVKTKKMSGDGVEAAADFGGSVLTGINGNPLGVLARQLGLPLHKVRDICPLYLPDGRS

VDSEVDSRVEVSFNKLLERVCKLRQAMIEEVKSVDVPLGTALEAFRRVYKVAEDKEERMLLNWHLANLETVECVKYGSDGVLVCAAGQEFRGDVALCTVP

LGVLKKGDIEFVPELPQRKKDAIHRLGFGLLNKVAILFPYNFWGGDIDTFGHLTEDLSMRGEFFLFYSYSSVSGGPLLVALVAGEAAIRFEMMSPVESVK

RVLDILKDIFNPKGIVVPDPVQAVCTRWGKDHFAYGSYSYVAVGSSGDDYDILAESVGDGRVFFAGEATSKQYPATMHGAFLSGMREAANILRVAKRRSS

MTIDTTKSVNQENDDLNKLFVKPDLTFGSFSALFDLNLNDHDSSSLLRVKIGGVVLDSGSLYLYAWLSKKRVIELSQVEGDENRMRMLNRNFGVSLVGRK

GLSSAAESLIANIKLSRPNFNETENGLMAEKENS

>GmPAO4

MESPSRSFVIIVGAGVSGISAAKLLAENGVKDLVILEASNCIGGRIRKENFGGVSVELGAGWIVGVGGKESNPIWELVAEYGLRTCFSDYTNVPYNIYDR

SGKIFSSGIAADSYKKAVDSAIRNLTNQEEADREGNSSKTTEPPSSPLELAIDFILHDFEMAEAVPISTFTAFGEREFLVADERGFDYLVYKMAEDFLLT

SEGKILDTRLKLNHVVREIEHRGSGVRVITEDDCIYEANYVLVSVSIGVLQSNLVAFHPPLPRWKLEAIEKCDVTVYTKIFLKFPYQFWPSGPGNEFFIY

AHDQRGYYTFWQQMENAYPGSDILVVTLTNGESKRVEAQSDEDTLREAMEVLKDMFGPNIPDATDILVPRWWNNRFQRGSYSNYPVISNLQVVRDVKAPV

GRIFFTGEHTSERFSGYVHGAYLAGINSSKELLEEMRKDNKRKNKSQSRVLEPLSALTECNIPRQ

>GmPAO5

MDAKELFSTNLIDGTVTSHIKRQCNSPPTLIVIGAGISGIAAARCLHDASFKVIVLESRDRIGGRIYTDYSFGCPVDMGASWLHGACNENPLAPLIRALG

LTLYHTGGDNSVIFDHDLESCMLFNIDGHQVPQHIMMEVGDTYKRILAETVKVRDEHPDDMPILQAISIVLNRHPELRQQGLAHEVLQWYICRMEAWFAS

DADIIPLKTWDQEHILTGGHGLMVQGYDPVVKALANDLDIRLNHRVTKISDGYNMVMVTVEDGRNFVADAVIVTVPIGILKANLIEFSPKLPHWKAEAIK

DIGMGNENKIALRFDAVFWPNVEVLGIVAPTSYACGYFLNLHKATGHPILVYMAAGKFAYDLEKLSDESAANFAMQQLKKMFPDASKPVQYLVSHWGTDP

NSLGCYACDLVGMPDDVYERLRAPVGNLFFGGEAVSMDDHQGSVHGAYSSGVMAAENCQRHLLQKQGHMESLPLVPSVRHEIFETTIPPQISRI

>GmPAO6

MDPNHLFFTHFRDGAIASRIEGQHRGALPSVIVIGAGISGLAAARSLYDASFKVTVLESRDRLGGRIHTDFSFGCPVDMGASWLHGVCNENPLAPLIRGL

GLSLYRTSGDNSVLYDHDLESYMLFNIDGKQVPQQMVIEVGDTFKKILEETGKVRDEHTEDISVSQAISIVLDKHPDLRQQGLAHEVLQWFICRMEAWFA

ADADMISLKTWDQEHVLSGGHGLMVQGYDPVIKVLAKDIDIRLNHRVKKISSGYNKVMVTVEDGRNFVADAAIITVPIGILKANLIEFEPKLPDWKVSAI

SDLGVGNENKIALRFDKVFWPNVELLGTVAPTSYTCGYFLNLHKATGHPVLVYMVAGRFAYDIEKLSDEAAANFVMQQLKKMFPNASKPVQYLVSRWGTD

PNSLGCYSYDLVGKPTDVYDKLRAPLGNLFFGGEAVSLDNQGSVHGAYSAGVMAAENCESYMLEKLGHAEKLSLASVRHEMLETLIPLQISRM

>ZmPAO1

MSSSPSFGLLALAAVLLALNLAQHGSLAATVGPRVIVVGAGMSGISAAKRLSEAGITDLLILEATDHIGG

RMHKTNFAGINVELGANWVEGVNGGKMNPIWPIVNSTLKLRNFRSDFDYLAQNVYKEDGGVYDEDYVQKR

IELADSVEEMGEKLSATLHASGRDDMSILAMQRLNEHQPNGPATPVDMVVDYYKFDYEFAEPPRVTSLQN

TVPLATFSDFGDDVYFVADQRGYEAVVYYLAGQYLKTDDKSGKIVDPRLQLNKVVREIKYSPGGVTVKTE

DNSVYSADYVMVSASLGVLQSDLIQFKPKLPTWKVRAIYQFDMAVYTKIFLKFPRKFWPEGKGREFFLYA

SSRRGYYGVWQEFEKQYPDANVLLVTVTDEESRRIEQQSDEQTKAEIMQVLRKMFPGKDVPDATDILVPR

WWSDRFYKGTFSNWPVGVNRYEYDQLRAPVGRVYFTGEHTSEHYNGYVHGAYLSGIDSAEILINCAQKKM

CKYHVQGKYD

>BdPAO1

MMKPSVAIVLLLVVAEYASLATAAGPKVIIVGAGMSGISAGKRLSDARISDFMILEATDR

IGGRIHKTKFAGVNVEMGANWVEGVNGKEKNPIWTMANSTGGLNLRTFRSDFDHLASNTY

KQDGGLYDDKFVEKIIERMDEVEESGTKLAGTLHLSGQEDMSVMAMQRLNDHMPTGPARP

VDMVIDYYQHDFEFAEPPRVTSLQNTVPLPTFDNFGDDVYFVADQRGFESVVYHVAGQYL

KTDKATGAIVDPRLKLNTVVREITHFPSGVTVKTEDNNVYKADYVMVSASLGVLQSELIR

FRPQLPSWKILSIYQFDMAVYTKIFLKFPRSFWPVGPGREFFLYASGRRGYYPVWQQFEK

QYPGSNVLLVTVTDDESRRIEQQPDNQTMAEAVAVLRKMFPGADVPDATKILVPRWWSNK

FYKGSFSNWPIGVNRYEYDLIRAPVGRVYFTGEHTSENYNGYVHGAYLAGIDSADVLINC

AKKKLCKYHVRGKHE

>BdPAO2

MAKNSSFGENVRRNPPTPSAIVIGGGFAGIAAANALRNASFEVVLLESRDRIGGRVHTDY

SFGFPVDLGASWLHGVCEENPLAPIIGRLGLPLYRTSGDDSVLFDHDLESYALYDTNGHQ

VPQEFVEKMGKVFEAILEETGKLREETEEDISIAKAIAIVMERNPHLRQEGMAHDVLQWY

LCRMEGWFATDADAISLQCWDQEVLLPGGHGLMVRGYRPVINTLAKGLDIRLGHRVVKIV

RHWNRVEVTVSSGKTFVADAAVVAVPLGVLKANTIKFEPRLPEWKEEAIRELSVGVENKI

VLHFSEVFWPNVEFLGVVSSTTYGCSYFLNLHKATGHPVLVYMPAGRLACDIEKMSDESA

AQFAFSQLKKILPNAAEPINYLVSHWGSDENTLGSYTFDGVGKPRDLYEKLRIPVDNLFF

AGEATSVQYTGTVHGAFSTGEMAAEECRMRVLEKFRELDMLEMCHPMAEQTATVSVPLLI

SRL

>BdPAO3

MDPNSFMTGGLLLPTIERRCASPPSVIVIGGGISGIAAARVLSNSSFEVTVLESRDRIGG

RVHTDYSFGCPIDMGASWLHGVSNENSLAPLIGHLGLRLYQTSGDNSVLYDHDLESCSLF

DKNGVQVPRETAAKVGKVFERILEETVKLRDEQEHDMPLQQAISIVLERHPHLKLQGLDD

RVLQWCVCRLEAWFAADADEISLKNWDQEHVLTGGHGLMVDGYYPVVQALARGLDIRLNQ

RVTKVSRQHNRVTVTIEDGTQHCADACIITVPLGVLKANIIKFEPELPLWKSSAIADLGV

GIENKVAMHFDRAFWPNVQVLGMVGPTPKTCGYFLNLHKATGNPVLVYMAAGRFAQEVEK

LSDKEALDIVMSHLKKMIPAAPEPTQYLVSRWGSDPNSLGSYSCDLVGKPADVCERFSAP

VENLYFAGEAASAEHSGAVHGAYSSGLAAAEDCRKRLMLQKGVPDLVQVAACEEVASAAA

EVVAPFQICGT

>BdPAO4

MDQPPNGFAAGGLFVQHIDGKNASAPSVIVIGGGISGIASARALSNASFKVTLLESRDRL

GGRVHTDYSFGCPIDLGASWLHGVCNENSLAPLIRLLGLRLYRTSGDNSVLYDHDLESYA

LFDKDGRQVPQEIVTKVGETFEQILKETVKVRDEYTNDMPLVQAISIVLDRNPHLKLEGL

QYEVLQWCICRLEAWFATDVDNISLKNWDQEHVLTGGHGLMVNGYDPVIKALARDLDIHL

NHRVTKIIQRYNKVIVCVEDGTSFVADAAIITVPLGVLKANIIKFEPELPDWKLSAISDL

GVGLENKIALRFDTIFWPNVEVIGRVAQTSNSCGYFLNLHKATGHPVLVCMVAGRLAYEM

EKLSDEESVEFVMSQLKRMLPGATEPVQYLVSRWGTDPNSLGSYSCDLVGKPADLYERFC

APVGNLFFAGEAACIDHSGSVHGAYSSGIGAAEDCRRRLSTQLGISDLFQVGKIVMREEM

ADAMVPLQISRL

>BdPAO5

MVANKPRIVIVGAGIAGLSAAQQLCRAGQGDKFDVVVVEAAPRAGGRVFTSEFAGHRVEM

GATWVQGITGSPVYALAHDAGALTEDAGGHLPYERMDGPFPDDRVLTVAEGGDVVDADKV

AKPVEELYRGMMDAARAGEAGGGGGGVEEYLRRGLRAYQAARTDGSGSKVKEVEEALLAM

HINRERTDTSADALGDLDLAAEGEYRDFPGDHVTIPGGYTRVVEHLVAALPPGTVRLGLR

LRRLDWGETPVRLHFADDGAAALIADHVILTVSLGVLKASLGKDAASAAGAIAFDPPLPQ

FKRDAVSRLGFGVVNKLFVELEAVEPEGGGEEQQLAGAAAPPDFPFLHMAFDGHVAKIPW

WMRGTESICPVHAGSSVALAWFAGREAKHLEFLPDDDVVRGVQATLDSFLPATSSSGATS

RWRVKRIERSRWAGDPLFVGSYSYVAVGSSGGDLDRMAEPLPRGGVPEADRTPPPLRVLF

AGEATHRTHYSTTHAAYLSGVREADRLLQHYP

>HvPAO1

QIGMLLPFAHRCSLYRCSITPLRVTRLACPFAHRRRPNSLPALRLPSVYIKSGWSGEEAI

VCDERLVSTTTRDMKPTTATAALVLALTLAHHASIAAAAGPRVIIVGAGMSGISAGKRLS

EAGITDLVILEATDHVGGRMHKQSFGGINVEVGANWVEGVNGAGRMNPIWPLVNSTLKLK

NFRSDFDGLADNVYKENGGVYERAYVQKRLDRWGEVEEGGEKLSAKLRPSGQDDMSILAM

QRLNDHLPNGPTSPVDMVLDYFKHDYEFAEPPRVTSLQNVVPLATFTDFGDDVYFVADQR

GYEAVVYYLAGQYLKADKSGNIVDPRLQLNKVVTEISHSGGGVTVRTEDAKVYKADYVMV

STSVGVLQSDLIQFKPRLPTWKVLSIYQFDMAVYTKIFVKFPRKFWPQGKGREFFLYASS

RRGYYGVWQEFEAQYPDANVLLVTVTDDESRRIEQQSDNQTKAEIVEVLRSMFPGEDVPD

ATDILVPRWWSDRFYRGTFSNWPIGVNRYEYDQLRAPVGRVYFTGEHTSEHYNGYVHGAY

LSGIDSADILIKCAQKRMCKYHIPGKFD

>HvPAO2

MKPSFVTAIAALLLIAAQHASIVAAGKGPRVIIVGAGMSGISAGKRLWDAGVRDLLILEA

TDRVGGRMHKHNFGGLNVEIGANWVEGLNGDKTNPIWPMVNSTLKLRNFYSDFDGVVANV

YKESGGLYDEEFVQKRMDRADEVEELGGKFAAKLDPSGRDDISILAMQRLFNHQPNGPTT

PVDMALDYYKYDYEFAEPPRVTSLQGTEPTATFADFGDDANFVADQRGFETIIYHIAGQY

LRSDKSGNIIDPRVKLNKVVRQISYNDKGVVVTTEDNSAYSADYVMVSTSLGVLQSDLIQ

FKPQLPAWKIMAIYRFDMAVYTKIFLKFPKKFWPTGPGKQFFVYASSRRGYYGMWQSFEK

EYPGANVLLVTVTDVESRRIEQQPDNVTMAEAVGVLRNMFPDRDVPDATDIYVPRWWSNR

FFKGSYSNWPIGVNRYEYDQLRAPVGGRVYFTGEHTSEHYNGYVHGAYLAGIHSADILMN

KALNNVDFKVRPKYDDELKAEAK