

## S1 File. Sequences for phylogenetic analysis

The phylogenetic analysis of OBPs

>ApisOBP1

ESDQVPINSSAAVESCLLETNMTRDEFEDMLTSPNARELTILKSHAHKCMFGC  
VMRKNHIVNDGVVSKEVLSKYVLNFYGRPDYKRRLIHKDVEHIVDVC AKKVA  
DESETDECELAATLVTCIVLEANKAGLVDDPARQI

>ApisOBP2

SDPCNISTCYKSGTTKPPMAVTPHLPVQSSSTQTSHPQTTYAKDHVHGSTTT  
KSGVNATVTTASGASVNGTEPPAVVKSSAGVTGNSTTPKPTMTEGHVALKQK  
LNTIAVKCKDELHAPQEIMALVSNTVVPQNEQQRCYLECVYKNLNLIKNNKF  
SVEDGKAMARIRFANQPEEHKKAVTIIETCEKEAVIDPKTTEKCAAGR VIRNCF  
VKNGEKINFFPKA

>ApisOBP3

RFTTEQIDYYGKACNASEDDLVVVKS YKVPPTTETGKCLMKCMITKLGLLND  
GSYNKTGMEAGLKKYWSEWSTEKIESINNKC YEEALLVSKEVVATCNYSYTV  
MACLNKQLDLKST

>ApisOBP4

QKQEPSGKCRAPDKAPLNLEIIIINTCQEEIKSALLQEALDILNDGNVEQNTPNY  
SSRSKREAEEDLTNEERRVAGCLLQCVYKKVKAVDET GFPVVDGLMKLYNEG  
VQDRNYIATLSAVRHCSIAQQLKQQQPSKSFDDGQTCDLAYEMFECVSEKI  
EENCGVENKSNN

>ApisOBP5

DAGHHRRGKELLDTEDSDFFRCKQASRKSCCGPENAMKRFGDKDKVA ADEC  
YAQVAEKFATVTATTPKQDLFSAEAVKITKKKQFCLHECIGKKNLLTEDGSLN  
KTFIADYAMKSVFKEQWQKQVGQKALDKCLEETYIPWPAEDKENVCNPVYV  
QFQHCLWLQYESNCPANKIKITKKCEKTRNRYRMQKSTSN

>ApisOBP6

MPNILPNLDSTWEKCFETFKQFKDKPETKEYKEMAHGKEPPCLFQCIFMQSGL  
TTSDGKLNEDAITKKMSEGINNDEKWKSIWQNSLNKCFDDVKQEDKKQILIM  
NTPAGRLMKCFLRDMYMSCPKNVWVESSECLNMKDLVQKCPMPVFKSP  
PKLI

>ApisOBP7

YLSEAAIKKTQQMLKTVCSKKHSVEEDVFTNIKKGIFPEDNNNIKCYFACNFK  
TMQLINQKGVIDKKMFKDKMSMMAPPNVYKILLPVIEQCTGKDKGEELCQSS  
YNVIKCAHSVDPKSLEFLPL

>ApisOBP8

ENNQQNGPSDRSATIFQSCIAETKLSGDALKGFRSMSIPKTQAEKCM MGCLM  
RKVNVINKGKFSVEEATKVAQKYGTNEAMMKKAKDLIDVCAKKAQSTTEE  
CALAGIVTTCIVEEAQKAGLSGGPGSRSRRTVSPKFRRDAM

>ApisOBP9

DDADAKDKELMSKLFTVVFKCFKDADWGTCGEMITTKYDITQAKYKQCTC  
HMACAGEELGMINASGQPEPAKFLEYVNKINNPDIKSQLQLIYDKCQNVKGS  
EKCDLAEQFAICAFKESPALKERVSTLMEMLVKMKPKSK

>ApisOBP10

RPQPDEMEEIKRRTLYNACAGKFPITEEIKNNAKNSIISDDPTFKCFLKCCFDEMS  
MIDEDGIIDGDSLKAMAPDHIKPILEQVIPSCTKNVKQDGCEASFEFISCGIKLN  
PLIVALLPL

>ApisOBP11

IFTTEQIDYYGKACNASEDDLIVLKSYPSTETGKCLMKCMITKLGLLNDDG  
SYNKTGMEAGLKKYWSEWATEKIETINEKCYEEGNTATLLYHVAIYFTCVSGD  
YSDVQLLIHCDGMFEQEVGSRQVNLKLLIMLKIGLSEPKR

>ApisOBP12

DDLVVVKSYPVPTTETGKCLMKCMITKLGLLNDDGSYNKTGMEAGLKKYW  
SEWSTEKIESINNKCYYEGDTSTLLYHVVIYFTCVKGGSSDVQLLVHCDGMFE  
QAVGSRQVNL

>ApisOBP13

MENGVTDFTHVSHGNTGSRSKNHRQGSYPSADYDSGQSNSNYNRQSLPTRR  
YRRDDSNEKSKRQKAAVTGSNNRLLGNNRFRNMTKTGGNQPQKGTYLDKM  
DACTIHCVFNQLEMLNSNSRPDKYSIVNIMTNQIKDVELKEFIQDSIDECFDL  
ELDSHNNKCEFSKNFAVCMENKAQRNCDDWDENLSANKINSAGLQDGTNQQ  
DKRKG Y

>AlinOBP1

DEQTNAMVAKAFNKCREEFPISSDDEIGGVREKTTIPESHNAKCLMACMLREG  
KMLRDGKYEKENALIMADVLNKDDPASADKAKQLVETCAGKVGTDAGGDE  
CEFAYKMAVCAAEAAKKGVRPPDF

>AlinOBP2

YQEQLKQTIRDCQDGKEVTDDLEEFKPLIPRNREEKCIMACVMRTYNIISN  
GHYDPKIAFGILKILKDHPEKLNKIKEVMDHCGEDVPSHMDDECLAGEIM  
QCEVKYQKAMGMA

>AlinOBP3

ISKEYSARMIAAKEKCQKEFNVTDSVVEDFMKRNIKPESSGKCMVHCIMEE  
MGMIDDHKINTEQVKLGKNEKWDDPALVELANQVADTCDQEVFTEGRCKCL  
VAVEYMMCLATHGDEVGLPHVDFEDSQDS

>AlinOBP4

GELPEEMKEMAQGLHDSVEETGVDNGLIAPCAKGNFADDAKLRCYFKCVF  
GNLGVISDEGELDAEAFGSILPDSMQELLPTIKSCGGTTGSDPCDLAMNFKC  
LQKADPVNFLVI

>AlinOBP5

AMSQAQMKQAMKTVRNMCIPKSGVDKEALAKMVNGEFDESQKLKCYLG  
CVLGMMQAVKNNKINLTMVRNQITKMLAPERGQRILAAFESCATVTGDDNC  
GLAFRAKCIYDTDKEAFIVP

>AlinOBP6

KELTDEQKEQIFAEIKNCMESTKLTDEEFESIMAKKELPTSIEGKCFTKCLMEK  
MEYLEEGGKINVIQVQAGMEENMEKESEITKAKEVIQQCADSVPPEDSCEYAY  
GISQCMYNKMKEAGISGS

>AlinOBP7

QQEDCKTAPAGWPRRPPQCCDLFPLEGMKKEFGSCIRQIGNRQSSAVPTAQA  
VRDARLCIEECVYKGLGFMDEHKLKNDQLLEQLKKGADKKDWTKPMEGAV

KRCHEITKRETPQEAAACQDSAHEFTHCAMRELFLNCPASEWNNNDECNLVK  
SRMQACPNIPPPPPPPQGFRRGQPPPQ

>AlinOBP8

VINKDYLEKVVTAKDCLKEFNVDSDVVEDFIVKYNKPQSESGKCMVACFM  
EERGMMKDGKTITEQVMLDNQEKWIAATHVNMGKEVIDTCDKEVPNEEND  
KCDLAVDYMMCLVCRGDEAGLPKMDVAQLKH

>AlinOBP9

SQRTKQQPKSKTKESVVGATRPRDAKATECVNKNVANEESASFFRKEIPETE  
AGKCLLACYLEGKGLIVGGKISSSGAARVAARAYPNRRVKTGNVKHILSHCG  
TIAGRESNNCEMAYKLADCTTTLSDKFRL

>AlinOBP10

QELPPPGDVKNKTVVFKNSFLRSACYCSSIYETSTLAIMALLMSEKSDDQNGK  
CFLNCMLQRYRLMSQDGSYNKDKFKPFLEYIPDSKFLQSIRGNLKNKCISEKDP  
DPCEKASKFIKCFYTRARNKGEIGASKEVIPADGF

>AlinOBP11

ISKEYHDKAIEAKNTCAKLHNVDDETIMTYWKNHQLPEKEPETCIVICYLKE  
MKLVVDGKVDADAWKASNKEKWDDDEKHVAAADEIVDKCSAEVPPPTENECE  
WGLALTKCALKHGKEAGIPPPDMEHPKRR

>AlinOBP12

MTTKLRSIGLVFIVSISYAFAYQELLKETIKKCQNGRDVTDDEVEEFTKPLVPK  
NEEERCLVACVFKEYKVIIDGHFDPVNALNVAKVVYKDYDPKVERIKDVLDH  
CGEDIPTHNDNECDLAGDIMKCEVKYLNVPKMTSLEFLAGSMAATAEP

>AlinOBP13

LVSghRALDgILPQANQDECREESNFRGELNDDVGRNVTQELKCFAAACSLMK  
LGIMNEKDGTVMTRLDDELIASTPGKDAADVFKTTVVEPCMKEVKKSTDY  
CEYSYQLIACGMSKVP

>AlinOBP14

MKPPGPPGSGTPTAEERAARKIAHECADECLYKSSNLLTSAGELDKDAIKAL  
VTKLYTGDWATAATTAIDKCLASAKGEVEATSKCKSGSFQLSRCFMRSMLGC  
PASSWTESTECAAAKARLTCPNAMAPMPHKK

>AlinOBP15

MVDHWCASRIHKRYHEALTHSRVVGGLRCCDEDEQTNAMVAKAFNKCREEFP  
ISDDEIGGVREKTTIPESHNAKCLMACMLREGKMLRDGKYEKENALIMADVL  
NKDDPASADKAKQLVETCAGKVGTDAGGDECEFAVKMAVCAAEAAKGLGV  
RPPDF

>AlinOBP16

LKDGEYNKDNAELMADVLYKDEPEHAEKSKQIIEELCSAELGKTKTDGDDCEYA  
YKMSVCAAKHAKELGVKTPEF

>AlinOBP17

VKEIVQNVSKKCAAETKASPEQAKIILTQNIPKNDVERCYLQCVYSGVGVIKD  
GKFSQEGGNKLVAMRFHDAKEKELAKQLINTCAKEIKAKDGEKCSLGKGIQ  
CFVAHGKEVNFPPHA

>AsutOBP1

DEQTNAMVAKAFNKCREEFPISDDEIGGVREKTTIPESHNAKCLMACMLREG

KMLRDGKYEKENALIMADV LNKDDPASADKAKQLVETCAGKVGTDAGGDE  
CEFAYKMAVCAAEEAKKLGVRPPDF

>AsutOBP2

YQEQLKQTIRDCQDGKEVTDDELEEF TKPLIPKNREEKCIMACVMRTYNIISN  
GHYDPKIAFGILKGILKDHPEKLNKIKEVMDHCGEDVPSHMDDECDLAGEIM  
QCEVKYQKAMGMA

>AsutOBP3

ELEEF TKPLIPKNREEKCIMACVMRTYNIISNGHYDPKIAFGILKGILKDHPEKL  
NKIKEVMDHCGEDVPSHMDDECDLAGEIMQCEVKYQKAMGMA

>AsutOBP4

GELPEEMKEMAQGLHDSVEETGVDNGLIAPCAKGNFADDAKLRCYFKCVF  
GNLGVISDEGELDAEAFGSILPDSMQELLPTIKSCGGTTGSDPCDLAMNFKC  
LQKADPVNFMVI

>AsutOBP5

VNEG DASMEALMECKKDFKVSREQIMSGDSSEEVKCF AECLMKKTTGGMDEG  
GNFNTEKIKEEGRKHAKTDDQKRAHDAAVDKCISETEAANPTGKCEKGF EFF  
KCVRGEMKSLM

>AsutOBP6

KELTDEQKEQIFAEIKNCMESTKLTDEEFESIMAKKELPTSKEGKCF TKCLMEK  
MEYLEEGGKINVI AVQAGLEENMEKESEITKAKEIIQQCADTVPPEDSCEYAY  
GISQCMYTKMKEAGISGGP

>AsutOBP7

QQEDCKTAPAGWPRRPPQCCDLFPLEGMKKEFGSCIRQIGNRQSSAVPTAQA  
VRDARLCIEECVYKGLGFMDEHKLNDQLLEQLKKGIADKKDWT KPMEGAV  
KKCHETITKRETPQEAACQDSAHEFTHCVMRELF LNCPASEWNNNDEC NLVK  
SRMQACPNIPPPPPPPQGF RGQGGPPPQ

>AsutOBP8

EGNINKEYLDKLIAAKEKCVKEFSVDD SIVEDLYVRYNKPPTESGKCMVACY  
MEERGMMKD GKTITEQVMLDNQEKWIAATHVNMGKEVIDTCDKEVPNEEN  
DKCDLAVDYMMLV KRGDEAGLPKMDVAQLKH

>AsutOBP9

SQRTKQQPKSKTKENVVGATRPRDAKATECVNQVKANEEESASFFRKEIPETE  
AGKCLLACYLEGKGLIVGGKISSSGAARLAARAYPNNRVKTGNVKHILSHCG  
TIAGRESNNCEMAYKLADCTTTLSDKFKL

>AsutOBP10

QELPPPGDVKNKT VVFKNSFLRSAKYCSSIYETSTLAIMALLMSEKSDDQNGK  
CFLNCMLQRYRLMSQDGSYNKDKFKPFLEYIPDSKFLQSIRGNLKN CISEKDP  
DPCEKASKFVKCFYTRARNKGEIGASKEVIPADGF

>AsutOBP11

VSKEYHDKAIAAKNTCAKLHNVDDETIMKFWKAHQ LPEKEPETCIICYMKE  
MKLVVDGKVDADAWKASNKEKW DDEKHVAAADEIVDKCSAEVPPTENECE  
WGLALTKCALKHGKEAGIPPPDMEHPKRR

>AsutOBP12

MFQAFVYQELLKETIKKCQNGRDVTDDEVEEF TKPLVPKNEEERCLVACVFK

EYKVIIDGHFDPVNALNVAKV VYKDYDPKVERIKDVLDHCGEDIPSHNDNEC  
DLAGDIMKCEVKYLNSIPKMTSLEFLAGSMAATAEP

>AsutOBP13

MGDVSNTYGSYDSYGASYGGYIRGSTPSGSGRGYKQSYEGDIGSGTSYARGA  
GYGGAASYGTGYNGNYGPDRTIYNPDSRTRGSYGGFMRGGGSSSNDGIFGA  
TDFGSYAKQIDTTSYDSSES YDRVESYGGIPSGTPRGIPYNGYHNNANIRWPDS  
NSQGNARKNGSSLEDVEPCTILCIFRQMKMTNGDSYLEQQSVAAVLMRRARD  
PQLKDFIGRTVQMCFERFGLANKGRCESAKLFALCMEEAGKMNCEWDVVK  
RFALKNPKPGPVLTMPQPLPPPPRG

>AsutOBP23

HPGHFDEDPECRPPHHHRLEEKDCCKIPNLFSNSRDEMHEL VHKCFEEAGIKK  
HGHDHGGPPPPGLGLPPPPPPKNDKSFDCVEQCFLKNLELINEEGEVKV  
DELKALIAEKFTGDWASVGSSTIEKCLEKSKTEENDSSKCKAGSKRILICLARE  
SFLSCPASEWTESDVCTAAKDRLEKCPHAPPPMNN

>AsutOBP31

MGRLLTKQNADLLIHPAGKIRVGVLPFLVGGIQDVIPCHDEARLKKPSGRHG  
GGGSPSAEDMAAHLRAHECADECVLKSQNLLTTDGELNKDAIKAQVVKST  
GDWAKLASDTADKCLASAKGEVTATATCKSGAGQFIYCFRRNLFLQCPSSSW  
TETTDCAAARITKCPNAKIPMGHHRH

>AsutOBP32

AECQRFKEMRPLSSCCTVEMNPNSSYNYTEGDPIINKCFGDFNSSATRPTGP  
PSGYDCELECLMIEFGYMGKDKTINKDKIVKSIEDEYSADFQEAGHKAIEICM  
GRKYHTSCPSGIDGMIECFAVQMMLNCPAKHWSGGEDCKETKQLIDKCGEVL  
SIFADYDTD

>AgosOBP2

SDPCNISTCYKSGTTKPPTTVTPTRLVQSSSTPTSHQQTTYAKDHVHSSTATK  
SGVNTTATTTSGASVNGTERTTVVKSSSGVAGNVTPKPTMTDGHVALKQKL  
NTIAVKCKDELHAPQEIMALVSNVVPQNEQQRCYLECVYKNLNLKNNKFS  
VDDGKAMAKIRFANQPEEHKKAVTIETCEKEAIIDPKTTEKCAAGR VIRNCFV  
KNGEKINFFPKA

>AgosOBP3

RFTTEQIDHYGKACNATEDDLVIVKSYKVPTS DTGKCLMKCMISKLGLLNDD  
GSYNKTGMEAGLKKYWSEWSTDTIESINNKC YEEALLVSKDIIATCN YAYVV  
MACLNKQLKLDNST

>AgosOBP4

QKQELSGKCRAPDKAPLNLEIIINICQEEIKSALLQEALDILNDGTLEQNTPSYS  
RSKRDADEDLSNEERRVAGCLLQCVYKKVKAVDETGFVVDGLMKLYNEGV  
QDRNYMATLSAVRHCSIAQQLKQQQPSKSFDDGQTCDLAYEMFECVSEKIE  
ENCGVENKLNLSQRQV

>AgosOBP5

EAGHQRRGKELLDTESDFFRCKQASRKSCCPENAMKRFGDKDKVADEC  
YAQVAEKFATVTATTPKQDLFSGEAVKITKKKQFCLHECIGKKNKLLTEDGSLN  
KTFIADYAMKSVFKEQWQKQIGQKALDKCLEETYIPWPAEETENKCNPVYVQ  
FQHCLWLEYESNCPDNKIKLTKKCEKTRNRYRMQKSPSNQ

>AgosOBP6

VG FERTWILRQKRMTNDNECRALFPSPEKKLPTCCQMPNILPGLDNAWEVCF  
EKFKQFKDKHATKEYKEMVHENEPCLFQC VFMQSGLTTS DGKVNEDAVIKK  
MAEGMDNDEKWKSIWRNTFNKCLNDVKQEDKEQIKVMNTPTGRMLKCFLR  
DLYMNC PKNVWVENSECSNLKDLVEKCPKLPPP VFQSPPKLI

>AgosOBP7

YLSEEAIKKTQKMLKNVCSKKHSVEEEVFTDIKKGIFPENNNNIKCYFACNFK  
TMQMVNQKGILDKKMFKDKMTMLAPPNVLA ILLPPIEQCIGNDKDTEICQSS  
YNFIKCAHRVDPKSLEFLPL

>AgosOBP8

ENNQQNSNDRSASIFQSCISETKLSGDALKGFRS SMSIPKTQAEKMMGCLMR  
KVVNVINKGKFSVEEATKVAQKY YGTNESMMKAKDLIDVCAKKAQSTTEEC  
ALAGIVTTCIVEEAQKAGLTGGPGSR SKRTVSPKFRHSIV

>AgosOBP9

ADDADTADKELMSKLITVAFKCFKDADWGT CGEMITTKYDITQAKYKQCTC  
HMACAGEDLGLINSNGQPEPAKFLEYVKRINNSVIKSQLQHIYDKCQNVKGT  
EKCDLAEQFAICAFKESPEMKERVTKLIEMLVKMKPKSK

>AgosOBP10

RPQPDEPDDIKKTLYNACSEKFP LTEEIKNNVKN SMVIDDQNFKCFLRCCFDE  
MSLIDEDGIIDGESLAAMAVDKIKPVAEKIVHDCLPAGKQE KQDGCEAAFKFF  
SCGMKLNPLTIELLPLQ

>BtabOBP1

VTHAEMDQLAVACNGQKADIDVMKQWRVPSSDSGKCLMKCLTDYYKMFDS  
EGKYS LKNTEDSLYKAWSEKPKHEMPIIAQHCDNMMRSAPKENLGSCQMSY  
DTMKCINEKAWELGWFN

>BtabOBP2

ESTTPIPMPEEEDEL PARFRSRVRSASEEKS KEDSSEECGPPQH HHPHPHKPPP  
ECCKGLPRPCNPTEDKKAWDT CVNKL SKKNPTTPQPTTQANGGKPGHGPMH  
GIDKQCMVECVYNETGLLTPDMKLQEAKISQKLTDKLKD TKFASMAPSVISK  
CFEKAKNAKDPKECKSGAGEFSECVNRELFMNCPTESWTNSEECQKMKEKL  
TKCPNMPVPMSPPPKP

>BtabOBP3

YDFEDAAFNARLIGDLDEYAVSSARNRRDADLDVDEFFQCKQRN QKVCCGK  
SSLFKNFGDKDKTAGKACYREIAEKLKRKDDLDLMDIFSCEQIKQM KKKH  
FCIHECIGKRKNLLNADGSINVLNMRTYLKKELFTEEWQQKVGDKAMEKCFN  
EKYVSSWPDS DSSDVKCNPISVQFQHCLWKQIELNCPDSEWKDTRRCNKIKE  
YLRKQELS QKNKISKN

>BtabOBP4

QDAKQKVA AAEKCKTEVHGGHDVLRIVGTSEL PKTEEQRCFLECVYKNLQL  
IVDDKFAEPGAKRLMMM KYGSNP DQLKIAQTEIETCAKEVKPTAGMKCSLA  
HNIRQCFAKEGQKRNFYIKA

>BtabOBP5

APNIQLQGSFANCKAPATAPQKLERVVEVCQNEIKFALLQEALNLLGLGIADD  
DSSEEEEPVKESKNRTVTIAPAKSRPKRDSSFSQEERRVAGCLLQCVYRKVKA

VDDTGFPQAEGMVRLYSEGVQDNYYYSATVQAVERCVSFAQALKLKQPNQK  
FASGQTCDLAYDMFECISEKIERACGGAAP

>BtabOBP6

AVSEQMIKQMKDMHKKTCMARSQVKKKEGLAKFMEEGVNDDPAFKKYTLC  
MLKNMQGSKNGKIAIKDIENQAKAMLPPLRDAILDATSKCSNTGGDTPEDIT  
YNFSKCSHKANVKSVMII

>BtabOBP7

MGGGGRPWSQNTQDSGRGGGNGGGRHQSNQYGNQNNDRYCSSGYQNSDR  
DRPRFSSSGSGGGGGGNDDDFYTKTQSEQRFRGDGGGGGRTRPGQYRVKV  
QYGSQGGGPPDSRAYPLGRKRRATKIISNNAKNATGRNPTSSETGKTSLEEL  
DACVVQCIFRQMEMLTEDARPDKNSVISVMTQRIRDPELKEFIQESIEECFDIIE  
SDAEGGKCEYSKNFAMCLEEKGRRNCEDWEEAAQINRFKGIQSGMSPPDTTN  
NYNPPNFNNFNSNNQGNRQNAFYNYNGK

>BtabOBP8

DQGNQGHQGGQGNQSEDEKVKAIYQKCQQESMAEEKDLDNFKKMEMPSS  
EKGKCMMACLMREAKIIVNKRFSKDGAMALAQRYYSTQPQNMDKAKQVIV  
ACDKQVEHERNECNIAGKLAECVVTEAQRVGLTSVPKG

>LstrOBP1

QIEQVGKAMANMCISSGVQRSLITKAMKGEIEDDRKCLKCFFGCIMEAVQVT  
KNGRMQPEVLKRRANAMLPKTMREMILPTIDSCSHIENEDKCELAISIVKCHF  
SVNGKNPFFNF

>LstrOBP2

RFSEEEKQLMNQVHAQCVTETGTAEDIVNKATKGDFTEDDNLKCYVKCIWST  
LTVMDDEGDFDVGVLVLEMLPADMKDIVMKAMSACTGAGAGLSPCEKAFV  
TKCLYKEAPADFFLP

>LstrOBP3

ANFAMMQQSLQGTNIPMIQSIAGELKFCMDVNSEQNSDGLDDYLPLLFNEEL  
PTTLGQKCFLTCLFNRFGLLKDGFLDTQTAKTLVETFYKDKHDEKTMANIAIN  
VCHVSAVPDVLNPCEIGFSLKSCFVDSNKKGKELRHKN

>LstrOBP4

DEATSSKPPSSPNAADALIASTTLSPASNETDAARAAIKEQLAKLTESCKTSSQ  
ANSDEAKIIGTESVPKTEGEKCFLQCVYTGLGIVKNEQFSVEGAKLLAQKRFQ  
SFPEELEKANQLIETCSKEAVKKDSKDKCPMGFLIRQCFVKNQKINFFPKA

>LstrOBP5

GLTPELKLKPLIDTCIKQSKAEETIGKLQNGHEIPSSQTGKCFIACMAEHM  
KLMKDGGKFEFAMTMEFIDKMOVQDKDKAAEIKKAVDDCFKSVPDTGDKCEM  
AAGLATCMKEHHAELAGMN

>LstrOBP6

ADSSDMLTVFNKCRDKTSATEDDIKTFRAQQIPSTTTGKCMACMFNHSGLM  
KDGKYDSEGALKLVGQVFADNPIKLGKARQLINGCTDEVKKENDKCEIASKI  
ADCTVKMSSQVGLS

>LstrOBP7

KIDKAKKEAAIKKCAETSASDEDVKKVRKEHVVPESSEEGKCFIACGFNTYD

MLKDNRINLEGVNAFFEKLYDEQEKRDIKAAASCAATESISGLNECHVAAK  
YFACLQRHPDFVKMKEDFDV

>LstrOBP8

YDFSDPYFNEHLQSAMEEIMEEEMLSIGRVQRDADQGQEVADYFKCKHRNL  
KTCCGKINLMKNYGDKGKIYGKQCYEEVVSFAFKSNSSTADDDDSMMDMFS  
CEKVKMIKLKHICVHECIGKKTILKEDGSLNAEEIKQYAREYMFNEEWSKEL  
GEKALDKCLTQTYNSVTKMLDEYEIKCNPTSVQFHHCLWKEIEMTCPEKVD  
LKAKCVRLRERLRKQQAAGM

>LstrOBP9

EDTTIKIKNPSPHKQQQVYQCAPPAPERLERIIEQCQDDIKTALLQEALNVLT  
DTSPRDLVKKTRSKREVFSGEEKRIAGCLLQCVYRKVKAVDDQGMPTVPGLV  
RLYSEGVQDRNYYVATVQAVQQCVSASQHFYYPNPQVLKEDGYTCDLAYDM  
FNCVSDKIEAFCGRTP

>NlugOBP1

DEATSSSDAESLITSTTLSPASNESDAARSAIKEQLAKLTESCKTSSQANSDDAK  
IIGTESVPKTEGEKCFLQCVYTGFGIVKNDQFSVEGARLLAQKRFQAFPEELEK  
ANQLIETCSKEAVKKDSKDKCPMGFLIRQCFVKNQKINFFPKA

>NlugOBP2

GLTPDKLKLKPLIDTCIKQSKVEEDTLGKLNHNGHEIPSSQSGKCFIACMAEH  
MKLMKDGFEPDMTEFIDKMOVQDKDKAAEIKKSLGECIKSVPEGDKCEMA  
AGLATCMKDHHAELAGMN

>NlugOBP3

KLDKAKKEAAIKKCQAETQATDEDVMKVRKEHIVPDSEEGKCFIACGFNSYD  
MLKDNRINLEGVNAFFEKLYDEQDKRDIKAAASCAATETVSGLNECHYAA  
KYFACMQRHPDFAKMKDDFDI

>NlugOBP4

ANFLMMQQSMQGTQMPMIQSIASELKFCMDVNAEQNSDGLNDYLPPLFNEE  
LPSTLGQKCFLTCLFNRFGLLKDGFLDTKTAKNLVETFYADKHDEKTMANIAI  
NVCHVAVPDALNPCEIGFSLKSCFVDSNKKGKELRGKN

>NlugOBP5

VFIDGRNEYRLTRQAPPDDECRPPRPGPNEDGVCCDMPPVFRTHDKFESCLE  
ELSSIFPPPPPHGHGPPPPPPGARGPPPPPPGGRRGPPPGFGGPPGHEPPIFA  
CAHECLFNKTGMLNGLNVEALKKKLEDELGENEVWKNLVQSIVDKCMES  
KDAPSNEMCTSGSHELARCVL RDMFMNCPQEKWKESDDCSNMKMKLEKCP  
ELVPPMAMRLPHPPMP

>NlugOBP6

EDTTIKIKTPSPHKHQVYQCAPPAPERLERIIEQCQDDIKTALQEALNVLTDT  
SPRDLVKKTRSKREVFSGEEKRIAGCLLQCVYRKVKAVDDQGMPTVPGLVRL  
YSEGVQDRNYYVATVQAVQQCVSASQHFYYPNPQVLKEDGYTCDLAYDMFN  
CVSDKIEAFCGRTP

>NlugOBP7

RFTEEEKQLMNQVHSQCISETGTSDELVTKATTGDFADDDNLKCYVKCIWSTL  
TVMDEGNFVDVGVLEVMLPADMKDTVMKAMNACTGVGGATPCEKAFAMT  
KCLYKEAPSDFFLP



>NlugOBP8

YDFSDPYFNEHLQSAMEEIMEEEMLSIGRVQRDADQGQEVAD EYFKCKHRNL  
KTCCGKINLMKNYGDKGKIYKQCYEEVVSFAFKTNSSTADDDDSMMDMFS  
CEKVKMIKLBKHCVHECIGKKTILKEDGTLNPEEIKQYAREYMFNEEWSKEL  
GEKALDKCLSQTYNVTKMLDEYEIKCNPSSVQFHHCLWKEIELTCPESKVDL  
KAKCVRLRERLRKQQAAGM

The phylogenetic analysis of CSPs

>AlinCSP1

AATYTSKYDNIDLDEILSNTRLYKKYFDCLANKGKCTPDGKELKESLPDALKT  
NCAKCTKKQEGTDKVFRLHVLKNKPNKYVLESYDPPGIYRKKYEAEAEK  
RGIKLPESH

>AlinCSP2

AEVYTSKYDNIDVDKILSNDRILTRYIKCLMEEGNCTNEGKELKKTLPDALAS  
GCTKCSEKQKAQTEKVLRLHLSKNRPRDWALLKTKYDPKGEYSKKYEKEAKA  
LTA

>AlinCSP3

AEQYTDKYDNIDIDEILNNDRMKYKNYFHCVMGNGKCTPDGLELAKAIPALQ  
TECAKCTDKQKKEVEKVLRFIINQKKDDYKLLLEEKFDPEGVYRKKYEAQKKL  
VEEGKPIEY

>AlinCSP4

EMTEEEFYTKVFEEVDPDFILDNERILTSYLKCFYNEIECNAHAEVVKKSIQDV  
LATVCGRCSKQKSIFKYSLNKFIPAHPKDWEKILSIYDPSGEAWPKVKAFIES

>AlinCSP5

YTTHYDYIDVDQVLNTRLYTKYVECLLGQKCTPEARELRDKLPEALQTNC  
ARCSERQASESHRIRFLIQNRQEDFKLLEAKYDPSGLYFKRFEEETKRNVSLS

>AlinCSP6

ADKYTDKYDNIDIDEILTNERLYKKYFDKCIQGTGKCTPDGIELKEKIPEALKTE  
CAKCNEKQKAGVEKVMRYLITKKPEDFKILEDKFDPEGVYRKKYEAQRKLV  
EEGKPIEY

>AlinCSP7

ASTYTDKYDNIDLDEILTNERLYKKYFDKCIQGGKCTPDGTELKEAIPDALKT  
ECAKCNKQKAGVEKVLRLHLLTKKAEDYKILEDKFDPEGVYRKKYEAQKKL  
ADEGKPIVL

>AlinCSP8

ADKYTDKYDNIDIDEILNNERLYKKYFDKILGNGKCTPDGTELKETIPDALKT  
ACAACNDKQKAGVEKVLRLHLLTKKAEDYKILEAKFDPEGVYRKKYEAQKKL  
AEEGKPIAL

>AlinCSP9

LAVVTREMREREFRRQLEVINVDSILINQRLIDKYIKLLKTGKCDPIMKDLRI  
ALPLILGHLCEARCSEK

>AlinCSP10

MRSNFINESIPDVLATVCGRCSKQKSIFKYSLNKFIPAHPKDWEKILSIYDPSG  
EAWPKVKAFIES

>AlinCSP11

KFFFSGLLLVCMASVSLCADEYTDKYDSVDLDEILNNQRLYQKYIDCVMGKG  
KCTPDGALLKEKIPAS

>AsutCSP1

QETYTSKYDNNVEDALKNDRLYKAYFNCLADRGPCCTREGNMLKEALPDGL  
RNNCSLCTDPQRRGTHQVIRFLFKYRPEDMKLLEEIYDPEGIYKTKYAEERKK  
LME

>AsutCSP2

AETRSSVSDEALEAALKDKRYLTRQLKCALGEGACDPVGRRLKTYAPLVLRG  
ACPKCTPSEVRQIQQLSHIQRHYPKEWAKILKQYAGQ

>AsutCSP3

ANQYTTKYDNIDLDDILKNQRLYKKYFECLTGKKGKCTPDGKELKEHLPDALK  
TGCSKCSEKQRAGSEKVIKHLKKNKPQDYAVLEKIYDPSGIYKKKYEAACKL  
GINV

>AsutCSP4

EMTEEEFYTKVFEEVDPDFILDNERILTSYLKCFYSEIECNAHAEVVKKSI  
PDV  
LATVCGRCSKQKSIFKYSLNKFIHPKDWKILSIYDPSGEAWPKVKAFIES

>AsutCSP5

GTYTDKYDNNLDEVLNNERLYRNYFNCLQGKKGKCTLDGAILKEVIPSALKT  
DCALCSVRQKKGAEKVLIFLITKKPDDFKILEDKFDPEGVYRKKYEAQRKLVE  
EGKPIH

>AsutCSP6

ADKYTDKYDNIDIDEILTNERLYKKYFDCIQGIGKCTPDGIELKEKIPALKEC  
AKCNEKQKAGVEKVMRYLITKKPEDFKILEDKFDPEGVYRKKYEAQRKLVEE  
GKPVEY

>AsutCSP7

SELYTDKYDSIDIDEILNDRMYKNYFNCFVGMNGKCTPDGTELKAKIPEALQ  
TECAKCSKQKKGVEKVLRLIKEKKDDYKLLLEEKFDPEGVYRKKYEAQKK  
LVEEGKPIEY

>AsutCSP8

ADMYTDQYDNIDIEILTNERLYKKYFDCIIGNGKCTPDGTELKETIPDALKTA  
CAKCNKQKAGVEKVLRLHLLTKAEDYKILEAKFDPEGVYRKKYEAQKLA  
EEGKPIVL

>AgosCSP1

MNILTIFCYVTVMCDTQVKPAVSAQRLQSVNQNVPTNDGRKTIRETSSYPTR  
YDYIDIEAVMNNERIIKILFNCVMSRGPCTREGLELKRIVPDAIQTECAKCNER  
QRKQAGKVLHLLQYKPEYWKMLVQKFDPNNVYLRKYMADNDDDEKLSL  
QKLSNDTTKKRNI

>AgosCSP2

AEEKYTTKFDNFDVDKVLNNRILTSYIKCLLDEGNCTNEGRELKRVLPDALK  
TDCSKCTDVQKDRSEKVIKFLIKNRSTDFDRLTAKYDPTGEYKKNLEKFEKER  
ASAKPLKA

>AgosCSP4

APQKDAVAASGPAYTTKYDHIDVDQVLASKRLVNSYVQCLLDKPKCTPEGAE

LRKILPDALKTQCAKCNATQKNAALKVVDRQLQKDYDAEWKQLLDKWDPKR  
EHFQKFQQFLAEKKGFTKF

>AgosCSP5

SPAGTATAAAVSADDEIKDFPAYMKRFDKLNVEQVLNNDRVLASHLKCFLNE  
GPCVQQSRDLKRVIPVIANNGCNGCTERQMTTIKSLNFLRTKKPTEWARLVK  
IYDPSGTKLNKFLDA

>AgosCSP6

APAKYTTKYDNVNIIDEILNNDRLVASYFKCLMETGKCTPEGEEIKRWLPEAIE  
NKCEDCSEKQKLGSEKIIKFLFEKNDMWKQLEAKYDPQGTYRQRYAEEAK  
KLNINV

>AgosCSP7

RPEDVKVENKPAVIKSETLAAPLPTNIVKRATDTIQLDSSLPNVSEDVLDKALS  
DRRFVQRQLKCATGEGPCDPIGRKIKAHAPLVLRGMCVKCSQSEIKQIQRVMS  
HIQKNYPKEYTKMLKQYQSGF

>AgosCSP8

ADGGIITPQQQQQTMMFTAPTGYVSTYDHIDVGRLLRNNKVVSGYVKCF  
VNEGPCPTDGKLVKAYLLPEIIRTVCCKTQRQDMARMVLKHIYTYRQADF  
EKIMQIYDTDGKRNEILAFMNH

>AgosCSP9

TFTRSTKFDDRTGIDIHLVKRDTDDVNDDENSVESEDEGFFYRFTFFQDSSDK  
EDDDDDEKKPDFITTFDIFKLLDEEYAMQQFYCVINEDPCDEVGMRLKATPE  
EINRNCERCTSTERNNIRRILNYVKKHYPQFWKRVEPIYKKKI

>AgosCSP10

MINTRPRKLVRCIRGVSISVAKGDDAVNAENKDDDSHLVNREEIQRYMSMME  
KINIDQMLNTRLMSNNVKCFLNEGPCTAHLREMKKMVPMLVKDSCSSCTK  
EQKIMMKAMDVAKARRPNDYKLSKFFDPEGKYEKKFLENLNEK

>AlucCSP1

AATYTSKYDNIDLDEILSNTRLYKKYFDCLANKGKCTPDGKELKESLPDALKT  
NCAKCTKKQQEGTDKVLRLHVLKNKPNDYKVLESYDPTGIYRKKYEVEAEK  
RGIKLPESH

>AlucCSP2

ADKYTDKYDNIDVDEILGNQRLYQKYFDQKGGKCTPDGKELKKNIPEALQ  
TDAKCSKQKAGVEKVLRLHLINEKPEDYKVLEEQFDPEGVYRKKYEHLKK  
KVEEGKPVEY

>AlucCSP3

AATYTTKYDNIDLDEILSNQRLYKKYYDCLANKGKCTPDGKELKEALPDALK  
TNSKCSKQKQEGTDKVLRYVLKNKPNDYKVLENIYDPSGNRYRKYEDEAS  
KRGIKLPESH

>AlucCSP4

SELYTDKYDNIDVDEILGNQRLYQKYFDQKGGKCTPDGKELKKNIPEALQT  
DCAKCSKQKAGVEKVLRLHLINEKPEDYKVLEEQFDPEGVYRKKYEHLKK  
VEEGKPIEY

>AlucCSP5

AELYTDKYDNIDVDEILGNQRLYQKYFDQKGGKCTPDGKELKKNIPEALQT

DCAKCSEKQKAGVEKVLRLHLINEKPEDYKVLLEEQFDPEGVYRKKYEHLKKK  
VEEGKPV

>AlucCSP6

SELYTDKYDNIDVDEILGNQRLYQKYFDCIQGKGKCTPDGAELKKNIPALQT  
DCAKCSEKQKAGVEKVLRLHLINEKPEDYKVLLEEQFDPEGVYRKKYEHLKKK  
VEEGKPIEY

>AlucCSP7

AELYTDKYDNIDIDEILNNDRMKYNYFNCVMGNGKCTPDGLELKAKIPEALQ  
TECAKCSKQKKGAEKVLRFIINQKKDDYKLEEKFDPEGVYRKKYEAQKK  
LAEEGKPIEY

>AlucCSP8

TKYDNIDLDEILSNQRLYKKYYDCLANKGKCTPDGKELKEALPDALKTNCSK  
CSKKQQEGTDKVLRYVLKNKPNDYKVLNIYDPSGNYRKRKRYEDEASKRGIKL  
PGSH

>BtabCSP1

ADTYTTQFDNIDLEAILKNEKLVLDNYTKCLMDEGPCTNEGRTLKLLPDALK  
TACAKCTEKQKTGARKVIKFYQTQHPEDFKKLQKYDPEGKFKAEFEKALFG  
QTL

>BtabCSP2

APAEDKYTDKYDNINVDDILGSKRLLKSYLTCLLDKSPCTPEGSELKRLLPDA  
LKTACSKCTEKQKEGAARIVERVTAEYPTWEKELSAKWDPTGEYWAKYKPL  
VQEYLKASA

>BtabCSP3

AAATKESTKESTYTNKYDNIDLGKILTNDRLFLNYFKCLMDEHTCSPDGAELK  
KVLDPALSNKCAKCTERQKSGSEKVIKHLIDNKPEMWAKLEAKYDPKGTYR  
KTYKNEAEKLGIV

>BtabCSP4

APAPLEQSDLEKFENMDLSSILSNKRLRTAYVNCMVVDKGPCTADAAEFKILP  
DLTETQCADCSAKFKELIKSVSTFQKDYPEDWKTLMHFDPDNKRAADLE  
KFMSS

>BtabCSP5

DDFYSDKYDNIDLDSILASKRLIRNYMNCFQKSPCTPEGTYLNQVLPEALKT  
ECAKCTEKQREGAVKAIKKLSAEYPEEWKEITDKLDPTGEQYAKFKARFP

>BtabCSP6

MVCSESVRCLTYFQVISLVYRLASAQSNNRATYTTKYDYINVDVAVMKNERIL  
KMLVECMLEGRCTREGLELKAAPDALATDCAKCSQMQRKHASRVIAYLIT  
YKKEYWNAALATKYDPDGSYRRKYGIPPQPQELSAGAAIQSPNLIKPTKTVKK  
TVTTVNNNTNLFKAKKRMTRREEKEMVRRRFPQLHFMPNMWASNIQKIEKK  
SERAPSIARRNVRRKAHTPTRRHSTQRTAPKRGQETG

>BtabCSP7

MPAPQTTRATISDEALESALNDKRYLMRQLKCALGEGVCDPVGRRLKTFAPL  
VLRGACPQCSPTETRQIQKVLSHIQRHHPKEWSKIVKQFTS

>BtabCSP8

ASTYTTKYDNIDLDEILNNDRIYKKYYDCLANKGKCTPDGKELKDILPDALKT

GCSKCNEKQKKGSEKVIKFLLDKDKKADYDVLEKIYDSNGVYRQKYADEAKK  
R

>BtabCSP9

APAEFYTSQFDNIDIESILKNEKLLDNYFNCLMDEGPCTLEGRTLKSLLPDALN  
TSCAKCTEKQKKIARRVMTFYLDKYPANSARIKKYDPENKFKDGIKALLGS  
R

>BtabCSP10

APAETYTTEFDGIDIDSVLKNEKLLDAYAKCLLDEGPCTREGRTLKTLPPDALE  
TTCAKCSPTQKEKAKKVITFYMEKYPENAQKIMKKYDPTGKYRKALEEAF  
GSL

>BtabCSP11

AISDDEYRLETLCSSPALEHFDITPILKNDRLVSSYFKCFMDEGPCTNEGKMKV  
RIIPEIMRTQCRNCNPTMRRIVRTVMKHMFTQTRPRDVDDFFLKYPHEMYD  
DLIEFMDEDNDY

>BtabCSP12

LPQKGPASTPRKQSVVEALGKKPEELPKTMKEALKRMEAVDVEKVLNDRIL  
TNYLKCFLNKGPCTSEAKNVKKSIALLVESRCVECDPKQRKIIKSMQVVKTK  
KPREYQELIKLYDPKGTQIAELEKFFASSK

>BtabCSP13

APPAGVDEKLLSKYDNFDVDRVLNDRVLANYIKCLMDEGSCTNEGRDLKK  
SIPDVLGGCDKCTEKQKSVTEKVIKHLINKRPKDWDRLSKKYDPGGQYKN  
KYADLYEKVQKEAAKESKEPSKPTKDTKETTKVTKDTKESAKAPKA

>LeryCSP

APQKDTAVVNGPAYTTKYDNIDIDQVLASKRLVNSYVQCLLDKKPCTPEGAE  
LRKILPDALKTQCTKCNATQKNAALKVVDRLQRDYDKEWKQLLDKWDPKR  
EYFQKFQQYLAEKKGKGVVKF

>TbraCSP1

SSKYTTSYDNLDLDEILNNHRLYTRYFQCLTNKARCTPDGKELKAVLPDALAT  
GCAKCTEKQKQGSEKVIKFLLNKPGDYEELEKMYDPNGTYRHRYEEEAKK  
LGIKV

>TbraCSP2

TSTYTTQYDNIDLDEILNNDRIYKKYFDCLAHNIKCTPDGKQLRDILPDALKT  
ACSKCSEKQKKGSEKVIKFMLEKKRADFDVLESQFDPTGIYRKKYAAEEAKKH  
GVHI

>TbraCSP3

TYTTKYDNIDVEEILNNDRLYKKYDCLANKANCTPDGKELKDILPDALKTQ  
CAKCSEKQKKGAEKVVRFMLENKRADFDALDKIYDPSGTYRKKYAAEAKRR  
GINV

>TbraCSP4

ASTYTTQYDNIDLDEILNHDRVYKKYFDCLVNKAKCTPDGKELKDILPDALK  
TGCTKCNEKQKKGAEKVIRFLENKRADFDALDKIYDPSGTYRKKYAPEAQK  
YGINV

>TbraCSP5

TTYTTKYDNIDLDAVLRNDRVYKTYYNCLTNKGKCSPEGKELKDKLPDALQT

GCSKCSARQKQGLEKIIKFLMNSKQADFKEFERIYDPTGEYRKRYAEQAKKK  
GIKV

>TbraCSP6

AKQSKVTTYTDKYDKIDVDAILHNERVLKRYIDCLMDRARCTPDGAELKKYIP  
EALETECAKCTEAQKRFAAGKVMSSFLQNKRNWYWNELGKYDPNGKFRKKYE  
EAALQDEYSSFYNE

>TbraCSP7

AEGRSAVSDEALEAALKDKRYLARQLKCALGEGACDPVGRRLKTYAPLVL  
GACPKCTPSEVKQIQQLAHIQRHYPKEWSKILKQYAGQ

>TbraCSP8

LTLQQIHRSWFQRLSVIPVEDVLNNRRILNKYLGCLLRRTVCAPEARDFRILL  
SILREPCNNCTERQRSSLKKIFEHVHTVHPGEWQEIMSMYDPKSEHQEKIINFI  
SNS

>TbraCSP9

QYEVNVEEILNNKRLLDAYTKCYLDRGPCPGPARESKKKLGEVFTTNCACN  
KKQRQDTRAAALRKLREKPKQLFLEIFEKYDAGSKHLDGFLIWLKKN

>TbraCSP10

EEDNEFNRLFDPNVDVAVLDNDRVLNAYLACFYDEGPCAERPCLVKSKIR  
EVLETTGKCNDDQQRQLKYILNKFIDKRPNDWQRILEIYDPDGAFRDNVEK  
LKQGLPAQ

>TbraCSP11

RPDSEEDAFYYQVFEEIDVDIILDNERLLRSYLTCFFDEAPCSAHAAVKE  
SIPEVMSTVCGKCNDDKQKAIYKHALNKFIPTHKEDWDHILRIYDPNGEY  
WPNIKKFMES

>TbraCSP12

STYTTKYDNIDLDEILSNERIYVKYYNCLLNKSRCTPDGKELKENLPDAL  
QATCDKCSEKQKQGSEKVLRFVLEKPPNDYLALEMYDPQKVYRHKY  
EKDAKERGLKFPD

>TbraCSP13

ASTYTTQYDNIDLDEILNNERVYIKYFNCLIGKDQCTPDGKELKETLPD  
ALKT ECKCTEKQKAGAEKVLRFVIENRPDDYKQVEAIYDPEGIYRQK  
FGAEAKEGIELPK

>TbraCSP14

DEGTYTTKFDNIDLDEILKNERIYKYLCLCKDEGKCTPDGRDLKDSL  
DALQSGCEKCEKQKAGTQKVLRFVLEKPPNDYLALEKIYDPNRIYRI  
KYKDEAEK LGLKFPNK

>TbraCSP15

DEGKYTTKYDNIDLDEILNNDRIYKYLCLCKGEGKCTPDGRELKVAL  
PDALKTRCVKCEKQKAGTEKVLRFILDKKPPNDYLVLEKIYDPDRMYR  
VMYKEDAE KLGLKFPNK

>TbraCSP16

MPLVFIGSIAAGEVYTSKYDNIDVDKILSNDRILSQYIKCLMDEGNCT  
NEGKELKKTLPDALATGCNKCSEKQRAQTEKVLRFVLEKPPNDYLALE  
KIYDPDRMYRMYKEDAE SKKYETKVPASK