```
PpaGPCATh1   1 K-----------------------------------------------------------------------------
PpaGPCATh2   1 K-----------------------------------------------------------------------------
SmoGPCATh1   1 MAPDDDAG---------------------------------------------------------------------
SmoGPCATh2   1 VQ--------------------------------------------------------------------------
ZmaGPCATh1   1 MASEVEDD---------------------------------------------------------------------
ZmaGPCATh2   1 MASEVEDE---------------------------------------------------------------------
OsaGPCATh    1 MASEVEDD---------------------------------------------------------------------
MacGPCATh1   1 MGDGETGS---------------------------------------------------------------------
StuGPCATh1   1 MSSNEESM---------------------------------------------------------------------
StuGPCATh2   1 MEEYYNGD---------------------------------------------------------------------
RcoGPCAT     1 MSNNEDPI---------------------------------------------------------------------
AthGPCAT     1 MANNEDSN---------------------------------------------------------------------
BvuGPCATh    1 MNNDSSEFHINILHHQLPF----------------------------------------------------------
NnuGPCATh    1 MSNKEDAE---------------------------------------------------------------------
EguGPCATh    1 MSEGEAGL---------------------------------------------------------------------
NadGPCATh    1 GWFTLKKRT--------------------------------------------------------------------
AtrGPCATh    1 MESYESP----------------------------------------------------------------------
LtuGPCATh    1 GEKKKGRRK--LLKNRP------------------------------------------------------------
AfiGPCATh    1 NPARIQHSE--------------------------------------------------------------------
KflGPCATh    1 MGLILEAA---------------------------------------------------------------------
EmuGPCATh    1 MVLAPLQNKS-------------------------------------------------------------------
OviGPCATh    1 MAPSIANII--------------------------------------------------------------------
SpuGPCATh    1 MSLQNGLNGCSLKQ---------------------------------------------------------------
CgiGPCATh    1 MRDTLKENTKQFATA--------------------------------------------------------------
LgiGPCATh1   1 MMVDKEDAKRKTQN---------------------------------------------------------------
LgiGPCATh2   1 MTSQSMNYNQNILIV--------------------------------------------------------------
LcoGPCATh    1 MAASMTKPPPELADSH-----S-MSS---------------------------------------------------
MciGPCATh1   1 MTPKEDTPGDSDLQDT-----T-VAAAAA-E----------------------------------------------
MciGPCATh2   1 MLTEERLEHLSSHESD-----A-------------------------------------------------------
MveGPCATh    1 MVTSSIDGPTHNPSST-----M-SS-SDS---DSD--VPLTRSISAPDPD-EHTYMDANATD-------------PAWISE
UmaGPCATh    1 MRRASSTSSTYSHVSD-----V-SS-SGD---ALR--PTLSRASSTACSD-----DGSLSTPSFRTHHSSASASME----
LbiGPCATh    1 MWHSTLVFADT------------------------------------------------------------------
SpoGPCATh    1 MDHLEFDENTDSEYSI-----F-E-----------------------------------------------------
SceGPCAT     1 MYKLDNNDIDDETN---------------------------------------------------------------
LthGPCATh    1 MSDIPDTLDTDSDEGS-------------------------------------------------------------
PkuGPCATh    1 MDIDNMEKDNGCSCTP-----T-SDES--------------------------------------------------
NcrGPCATh    1 MADLAEPEISLPVSGL-----S-HKSEGAPSTDGE--AILTPDTPSTPPLNSSPGEHDPNTPT-----------LDVTT
CbaGPCATh    1 MSEPIRIPLSKTDTTL-----D-EM--AS-----H--DIAGSASTDTAGS-LTGALTPGYQSG-----------YQSSS
AclGPCATh    1 MEGAGLDDHPGGGRTA-----Q-VTGAGN-----S--PLLPPAAVDDMDA-VYDTDEYAPSST-----------RSYSP
CglGPCATh    1 MADSEDRSKPISIPGN-----N-NRWEGA-STDSE--AILTPELSGSPPD-DDSHEHAVVTPT-----------LGPTV
BbaGPCATh    1 MDDEQPAAVSHPNPNA-----T-FQDSIS-D---E--HHTEPGLTSPLSS-SPPDPTILDTPS-----------LIATT
DdiGPCATh1   1 MEVLASEISSNEKSAF-------------------------------------------------------------
DdiGPCATh2   1 MEKKDKNEKIISSSPI-----N-IFRRYS-I----------------------------------------------
AsuGPCATh    1 MTMTMMVIKVEKHSKV-----G-------------------------------------------------------
EdiGPCATh    1 MSTSSEEKYQREFQ---------------------------------------------------------------
AcaGPCATh1   1 MDHKKVDKHEHNDSRA-----G-------------------------------------------------------
AcaGPCATh2   1 MADAVHNEPEADIRAY-------------------------------------------------------------
PbrGPCATh    1 IQQTSADLAYVGTTRL--RRVYRVASADC---DPV--V--------------CINKVT----------------IY
NgrGPCATh1   1 MEKQEEIEITNNNFDS------E------------------------------------------------------
NgrGPCATh2   1 MSQQQTKKKKESKQEK------K------------------------------------------------------
MbrGPCATh    1 MASESTVPADPAESPL-----G-LSQ---------------------------------------------------
BsaGPCATh    1 MWWEIFGVFGVC-----------------------------------------------------------------
OtaGPCATh    1 MRRTRSVRSDD------------------------------------------------------------------
MpuGPCATh1   1 MASPIAAAAAT------------------------------------------------------------------
MpuGPCATh2   1 MSPSFAEP---------------------------------------------------------------------
MspGPCATh1   1 MAEAVMRRRRR------------------------------------------------------------------
MspGPCATh2   1 MNLEPPTL---------------------------------------------------------------------
CreGPCATh    1 MESFGVAAAEAA-----------------------------------------------------------------
CowGPCATh    1 MPANEAPLSPSINATT------ATSPATT---ETTTAAATNTNPSGAAAN-GVQDGGKAQ-----------------T
CmeGPCATh    1 MDDGGRALGSASVDHF-----D-ET----------------------------------------------------
```

```
PpaGPCATh1     2  --------------------------------------------------------------------
PpaGPCATh2     2  --------------------------------------------------------------------
SmoGPCATh1     9  --------------------------------------------------------------------
SmoGPCATh2     3  --------------------------------------------------------------------
ZmaGPCATh1     9  --------------------------------------------------------------------
ZmaGPCATh2     9  --------------------------------------------------------------------
OsaGPCATh      9  --------------------------------------------------------------------
MacGPCATh1     9  --------------------------------------------------------------------
StuGPCATh1     9  --------------------------------------------------------------------
StuGPCATh2     9  --------------------------------------------------------------------
RcoGPCAT       9  --------------------------------------------------------------------
AthGPCAT       9  --------------------------------------------------------------------
BvuGPCATh     20  -----------------------------------------------------IE-------------
NnuGPCATh      9  --------------------------------------------------------------------
EguGPCATh      9  --------------------------------------------------------------------
NadGPCATh     10  --------------------------------------------------------------------
AtrGPCATh      8  --------------------------------------------------------------------
LtuGPCATh     16  --------------------------------------------------------------------
AfiGPCATh     10  --------------------------------------------------------------------
KflGPCATh      9  --------------------------------------------------------------------
EmuGPCATh     11  --------------------------------------------------------------------
OviGPCATh     10  --------------------------------------------------------------------
SpuGPCATh     15  --------------------------------------------------------------------
CgiGPCATh     16  --------------------------------------------------------------------
LgiGPCATh1    15  --------------------------------------------------------------------
LgiGPCATh2    16  --------------------------------------------------------------------
LcoGPCATh     21  -----------------------------------------------------GS-------------
MciGPCATh1    25  -----------------------------------------------------TA-------------
MciGPCATh2    18  -----------------------------------------------------S--------------
MveGPCATh     56  PTTP------------------SLGPTS------------------LVPN------------------
UmaGPCATh     60  --------------------------------------------------------------------
LbiGPCATh     12  --------------------------------------------------------------------
SpoGPCATh     19  --------------------------------------------------------------------
SceGPCAT      15  --------------------------------------------------------------------
LthGPCATh     17  --------------------------------------------------------------------
PkuGPCATh     22  --------------------------------------------------------------------
NcrGPCATh     61  PKSP---------------------AVLS---------------------RNS---------------
CbaGPCATh     53  PGSP---------------------YLLS---------------------RNP---------------
AclGPCATh     55  TASP---------------------PSLS---------------------RNH---------------
CglGPCATh     59  PTSP----------------------RLS---------------------RNP---------------
BbaGPCATh     56  PKSP----------------------KLS---------------------RHP---------------
DdiGPCATh1    17  -------------------------------------------TEEEDDYYEFSDSETDSL--------
DdiGPCATh2    25  -----------------------------------------------------AD-------------
AsuGPCATh     18  --------------------------------------------------------------------
EdiGPCATh     15  --------------------------------------------------------------------
AcaGPCATh1    18  --------------------------------------------------------------------
AcaGPCATh2    17  -----------------------------------------EPQAADA--------------------
PbrGPCATh     40  PAS------------------------AAPKG---------------------IFVW------MPLNRA----RRRG
NgrGPCATh1    18  -------------------------------------ERMDQRMDQGKEGMADHYGSS-----------
NgrGPCATh2    18  -----------------------------------------QEQDP----------------------
MbrGPCATh     21  -------------------------------------------------ES-----------------
BsaGPCATh     13  ----------------LVVYAAVTRFTTLAAITQMGSIQ-----------------------------
OtaGPCATh     12  --------------------------ATVDE-------------------L-----------SRARERAK---
MpuGPCATh1    12  --------------------------AAVTG-------------------LV-----------RRM----RRR-
MpuGPCATh2     9  --------------------------------------------------------------------
MspGPCATh1    12  --------------------------GE----------------------------------------
MspGPCATh2     9  --------------------------------------------------------------------
CreGPCATh     13  --------------------------------------------------------------------
CowGPCATh     52  ---SSTSENAVQTMERPRSAL--------------LRPGQEEQEQAEREAHQTTHQLHDGYAAA---------------
CmeGPCATh     20  ----------------------------------------------------------D---------
```

```
PpaGPCATh1    2 --------------------------------------------------------------------
PpaGPCATh2    2 --------------------------------------------------------------------
SmoGPCATh1    9 --------------------------------------------------------------------
SmoGPCATh2    3 --------------------------------------------------------------------
ZmaGPCATh1    9 --------------------------------------------------------------------
ZmaGPCATh2    9 --------------------------------------------------------------------
OsaGPCATh     9 --------------------------------------------------------------------
MacGPCATh1    9 --------------------------------------------------------------------
StuGPCATh1    9 --------------------------------------------------------------------
StuGPCATh2    9 --------------------------------------------------------------------
RcoGPCAT      9 --------------------------------------------------------------------
AthGPCAT      9 --------------------------------------------------------------------
BvuGPCATh    22 -------------------------VR--E------------------------------QI-LKSLLFQSI-
NnuGPCATh     9 --------------------------------------------------------------------
EguGPCATh     9 --------------------------------------------------------------------
NadGPCATh    10 --------------------------------------------------------------------
AtrGPCATh     8 --------------------------------------------------------------------
LtuGPCATh    16 --------------------------------------------------------------------
AfiGPCATh    10 --------------------------------------------------------------------
KflGPCATh     9 --------------------------------------------------------------------
EmuGPCATh    11 --------------------------------------------------------------------
OviGPCATh    10 --------------------------------------------------------------------
SpuGPCATh    15 --------------------------------------------------------------------
CgiGPCATh    16 --------------------------------------------------------------------
LgiGPCATh1   15 --------------------------------------------------------------------
LgiGPCATh2   16 --------------------------------------------------------KP-----------
LcoGPCATh    23 ---------------SS---NG-DD---LS-DF-------------------EHDLDVI-------EGW-
MciGPCATh1   27 ---------------SS---SG------IK-NF------------------G---NEDMFSL-------DEW-
MciGPCATh2   19 ---------------TL---LS-ED---ST-EY------------------D---TDELTTV-------DSW-
MveGPCATh    70 -------------------------------------------------ILTQLSFS--------------
UmaGPCATh    60 -------------------------------------------------GIDLLGSSASA-------AAL-
LbiGPCATh    12 --------------------------------------------------------------------
SpoGPCATh    19 ------------------------E-DN-----------------------D---YGLHGLD-------DSV-
SceGPCAT     15 ------------------------------------------------------NSV-------SLT-
LthGPCATh    17 -----------------------------------------------------EPMKV-------TLA-
PkuGPCATh    22 --------------SS---------NAYADL----------------------S---SSDAPFF-------EGV-
NcrGPCATh    72 --------------SF---SG--SISSTL-HD---------------------E---WDVFPPL-------DRL-
CbaGPCATh    64 --------------SH---IG--S--QSL-QE---------------------D---W--EVPL-------DKL-
AclGPCATh    66 --------------S----------FSY-QD---------------------D---WDTFPPL-------DKL-
CglGPCATh    69 --------------SF---SG--S--SSY-QE---------------------D---WDPFPPL-------DRL-
BbaGPCATh    66 --------------SF---SG--S--SSY-HD---------------------D---WDSLPPL-------DRL-
DdiGPCATh1   35 --------------DYN---LE-----DSSN-D-ENSGDGDGDGGVVESDDNKNLKRRKR---SKRPTTL-------GESN
DdiGPCATh2   27 --------------VG---SGSSISRLQH-DS------------------------N---NN-----------NSP-
AsuGPCATh    18 --------------------ELSPSSR-RL----------------------K---DK-----------SKD-
EdiGPCATh    15 --------------------------------------------------------------------
AcaGPCATh1   18 -------------------EQ---VE-EL-----------------------R---DENPSTV-------SED-
AcaGPCATh2   24 --------------QH---LH----DESE-EQHHKSQNDS---------------------------
PbrGPCATh    62 SADERMTE-DEVGSASDVA----T---DSE-ED-----------------------D---ER----------SASE-
NgrGPCATh1   39 --------------------------------------------------------------------
NgrGPCATh2   23 --------------------------------------------------------------------
MbrGPCATh    23 --------------A------------S-Q-----------------------------VI-------EDI-
BsaGPCATh    36 ---------------------------ERAMPWA----------------------------------
OtaGPCATh    26 --------------------------------------------------------------------
MpuGPCATh1   25 ---DALSDDDENGA-TTSSDEG-V---GS---P-----------------------R---GH----VVAHHA------
MpuGPCATh2    9 --------------------------------------------------------------------
MspGPCATh1   14 ----------ENGY-MSPTSDG-E---DS---P-----------------------R---EW----RR---RNPLAP-
MspGPCATh2    9 --------------------------------------------------------------------
CreGPCATh    13 --------------------------------------------------------------------
CowGPCATh    99 ---------------------------ESEQDHA----------------------------------
CmeGPCATh    21 --------------SS---AF-PD---SE-AY--------------------------YEPDL-------LSL-
```

```
PpaGPCATh1    2  ------------------------------------------------------------------------
PpaGPCATh2    2  ------------------------------------------------------------------------
SmoGPCATh1    9  ------------------------------------------------------------------------
SmoGPCATh2    3  ------------------------------------------------------------------------
ZmaGPCATh1    9  ------------------------------------------------------------------------
ZmaGPCATh2    9  ------------------------------------------------------------------------
OsaGPCATh     9  ------------------------------------------------------------------------
MacGPCATh1    9  ------------------------------------------------------------------------
StuGPCATh1    9  ------------------------------------------------------------------------
StuGPCATh2    9  ------------------------------------------------------------------------
RcoGPCAT      9  ------------------------------------------------------------------------
AthGPCAT      9  ------------------------------------------------------------------------
BvuGPCATh    36  ------------------------------------------------------------------------
NnuGPCATh     9  ------------------------------------------------------------------------
EguGPCATh     9  ------------------------------------------------------------------------
NadGPCATh    10  ------------------------------------------------------------------------
AtrGPCATh     8  ------------------------------------------------------------------------
LtuGPCATh    16  ------------------------------------------------------------------------
AfiGPCATh    10  ------------------------------------------------------------------------
KflGPCATh     9  ------------------------------------------------------------------------
EmuGPCATh    11  ------------------------------------------------------------------------
OviGPCATh    10  ------------------------------------------------------------------------
SpuGPCATh    15  ------------------------------------------------------------------------
CgiGPCATh    16  ------------------------------------------------------------------------
LgiGPCATh1   15  ------------------------------------------------------------------------
LgiGPCATh2   18  ------------------------------------------------------------------------
LcoGPCATh    43  -------------------------------------------------TTADFISE----------------
MciGPCATh1   46  -------------------------------------------------ETSDFISE----------------
MciGPCATh2   40  -------------------------------------------------SSHDFVAK----------------
MveGPCATh    78  ------------------------------------------------------------------------
UmaGPCATh    74  ------------------------------------------------------------------------
LbiGPCATh    12  ------------------------------------------------------------------------
SpoGPCATh    33  ------------------------------------------------------------------------
SceGPCAT     21  ------------------------------------------------------------------------
LthGPCATh    25  ------------------------------------------------------------------------
PkuGPCATh    41  ------------------------------------------------------------------------
NcrGPCATh    95  ------------------------------------------------------------------------
CbaGPCATh    83  ------------------------------------------------------------------------
AclGPCATh    83  ------------------------------------------------------------------------
CglGPCATh    90  ------------------------------------------------------------------------
BbaGPCATh    87  ------------------------------------------------------------------------
DdiGPCATh1   82  KDGETANSVSISAGTSKSNISSPLVDGADILSKPNSSPTSSSLSGSNSAN--GFLSDDDDLLLNGNEQLNENHNTNSTNG
DdiGPCATh2   47  ----------------------------------------------LVPTSC----------------------
AsuGPCATh    33  ----------------------------------------------SDKYLD----------------------
EdiGPCATh    15  ------------------------------------------------------------------------
AcaGPCATh1   35  ---------------------------------------------TNDAFVD----------------------
AcaGPCATh2   42  -----------------NATQPERAEDLA-------------------------------------------
PbrGPCATh    93  ------------------------------------------------------------------------
NgrGPCATh1   39  ------------------------EDED--------------------------------------------
NgrGPCATh2   23  ------------------------VTTA--------------------------------------------
MbrGPCATh    31  --------------------------------------R--NFMSDL--------------------------
BsaGPCATh    43  --------------------------SFS-------------------------------------------
OtaGPCATh    26  ------------------------------------------------------------------------
MpuGPCATh1   56  ------------------------------------------------------------------------
MpuGPCATh2    9  ------------------------------------------------------------------------
MspGPCATh1   40  ------------------------------------------------------------------------
MspGPCATh2    9  ------------------------------------------------------------------------
CreGPCATh    13  ------------------------------------------------------------------------
CowGPCATh   106  -------------------------SCD--------------------------------------------
CmeGPCATh    39  ------------------------------------------------------------------------
```

```
PpaGPCATh1     2  --------------------------------------------------------------------------
PpaGPCATh2     2  --------------------------------------------------------------------------
SmoGPCATh1     9  --------------------------------------------------------------------------
SmoGPCATh2     3  --------------------------------------------------------------------------
ZmaGPCATh1     9  --------------------------------------------------------------------------
ZmaGPCATh2     9  --------------------------------------------------------------------------
OsaGPCATh      9  --------------------------------------------------------------------------
MacGPCATh1     9  --------------------------------------------------------------------------
StuGPCATh1     9  --------------------------------------------------------------------------
StuGPCATh2     9  --------------------------------------------------------------------------
RcoGPCAT       9  --------------------------------------------------------------------------
AthGPCAT       9  --------------------------------------------------------------------------
BvuGPCATh     36  ------------------------------SLCKIPSIS-----------------------------------
NnuGPCATh      9  --------------------------------------------------------------------------
EguGPCATh      9  --------------------------------------------------------------------------
NadGPCATh     10  --------------------------------------------------------------------------
AtrGPCATh      8  --------------------------------------------------------------------------
LtuGPCATh     16  --------------------------------------------------------------------------
AfiGPCATh     10  --------------------------------------------------------------------------
KflGPCATh      9  --------------------------------------------------------------------------
EmuGPCATh     11  --------------------------------------------------------------------------
OviGPCATh     10  --------------------------------------------------------------------------
SpuGPCATh     15  --------------------------------------------------------------------------
CgiGPCATh     16  --------------------------------------------------------------------------
LgiGPCATh1    15  --------------------------------------------------------------------------
LgiGPCATh2    18  --------------------------------------------------------------------------
LcoGPCATh     51  ---------------------NDFDMI--E-------------------------------------------
MciGPCATh1    54  ---------------------NDFDMI--D-------------------------------------------
MciGPCATh2    48  ---------------------DDYAMI--G-------------------------------------------
MveGPCATh     78  -----------------------L--D----------------------------------------------
UmaGPCATh     74  ---------------------PLSDLF--E-------------------------------------------
LbiGPCATh     12  ------------------------F--E---------------------------------------------
SpoGPCATh     33  ---------------------GFTDLF--D-------------------------------------------
SceGPCAT      21  ---------------------SLLEFL--D-------------------------------------------
LthGPCATh     25  ---------------------NWVEFL--D-------------------------------------------
PkuGPCATh     41  ---------------------TLLDLL--Q-------------------------------------------
NcrGPCATh     95  ---------------------TVLDLL--D-------------------------------------------
CbaGPCATh     83  ---------------------TFFDIF--D-------------------------------------------
AclGPCATh     83  ---------------------TVFDLL--D-------------------------------------------
CglGPCATh     90  ---------------------TVLDIL--D-------------------------------------------
BbaGPCATh     87  ---------------------TVLDLL--D-------------------------------------------
DdiGPCATh1   160  ATNNNNNNNNNSGSNSPSHQQSSEL------------------------------------------------
DdiGPCATh2    53  --------------------------D--S-------------------------------------------
AsuGPCATh     39  --------------------------E----------------------------------------------
EdiGPCATh     15  --------------------------------------------------------------------------
AcaGPCATh1    42  -----------------------------A-------------------------------------------
AcaGPCATh2    54  ---------------LQIASGKV--------------------------------------------------
PbrGPCATh     93  --------------------VFGQIV--D--------------------------------------------
NgrGPCATh1    43  -----------------TLSDQL-------------------------------------------------
NgrGPCATh2    27  -----------------TITPTT-------------------------------------------------
MbrGPCATh     38  --------------------DFATQQ--D--------------------------------------------
BsaGPCATh     46  --------------------------------------------------------KPDA--GGGS
OtaGPCATh     26  --------------------------------------------------------------------------
MpuGPCATh1    56  --------------------------------------------------------------------------
MpuGPCATh2     9  --------------------------------------------------------------------------
MspGPCATh1    40  --------------------FFK--------------------------------------------------
MspGPCATh2     9  --------------------------------------------------------------------------
CreGPCATh     13  --------------------------------------------------------------------------
CowGPCATh    109  ---------------HLLHDDHAALLDAA--DDLLAPGIQLQGSVNDMNDRVESYVMQTLDRIASGLDSDDEDPDGAD
CmeGPCATh     39  ---------------------SLSDIF--T-------------------------------------------
```

```
PpaGPCATh1      2  --------------------------------------------------------------------
PpaGPCATh2      2  --------------------------------------------------------------------
SmoGPCATh1      9  --------------------------------------------------------------------
SmoGPCATh2      3  --------------------------------------------------------------------
ZmaGPCATh1      9  --------------------------------------------------------------------
ZmaGPCATh2      9  --------------------------------------------------------------------
OsaGPCATh       9  --------------------------------------------------------------------
MacGPCATh1      9  --------------------------------------------------------------------
StuGPCATh1      9  --------------------------------------------------------------------
StuGPCATh2      9  --------------------------------------------------------------------
RcoGPCAT        9  --------------------------------------------------------------------
AthGPCAT        9  --------------------------------------------------------------------
BvuGPCATh      45  --------------------------------------------------------------------
NnuGPCATh       9  --------------------------------------------------------------------
EguGPCATh       9  --------------------------------------------------------------------
NadGPCATh      10  --------------------------------------------------------------------
AtrGPCATh       8  --------------------------------------------------------------------
LtuGPCATh      16  --------------------------------------------------------------------
AfiGPCATh      10  --------------------------------------------------------------------
KflGPCATh       9  --------------------------------------------------------------------
EmuGPCATh      11  --------------------------------------------------------------------
OviGPCATh      10  --------------------------------------------------------------------
SpuGPCATh      15  --------------------------------------------------------------------
CgiGPCATh      16  --------------------------------------------------------------------
LgiGPCATh1     15  --------------------------------------------------------------------
LgiGPCATh2     18  --------------------------------------------------------------------
LcoGPCATh      58  --------------------------------------------------------------------
MciGPCATh1     61  --------------------------------------------------------------------
MciGPCATh2     55  --------------------------------------------------------------------
MveGPCATh      80  --------------------------------------------------------------------
UmaGPCATh      81  --------------------------------------------------------------------
LbiGPCATh      14  --------------------------------------------------------------------
SpoGPCATh      40  --------------------------------------------------------------------
SceGPCAT       28  --------------------------------------------------------------------
LthGPCATh      32  --------------------------------------------------------------------
PkuGPCATh      48  --------------------------------------------------------------------
NcrGPCATh     102  --------------------------------------------------------------------
CbaGPCATh      90  --------------------------------------------------------------------
AclGPCATh      90  --------------------------------------------------------------------
CglGPCATh      97  --------------------------------------------------------------------
BbaGPCATh      94  --------------------------------------------------------------------
DdiGPCATh1    185  ------PLLNLFQKFLNREAI-----------------------------------------------
DdiGPCATh2     55  --------------------------------------------------------------------
AsuGPCATh      40  --------------------------------------------------------------------
EdiGPCATh      15  --------------------------------------------------------------------
AcaGPCATh1     43  --------------------------------------------------------------------
AcaGPCATh2     62  ------SKKSFFERFTVLWAQ-----------------------------------------------
PbrGPCATh     100  --------------------------------------------------------------------
NgrGPCATh1     49  ------VVEDEEE-YAYY-DW-----------------------------------------------
NgrGPCATh2     33  ------TTT--------T-NN-----------------------------------------------
MbrGPCATh      45  --------------------------------------------------------------------
BsaGPCATh      54  GHRSTT-----------------------NTTATSSQQPDKATS-----------------SEAT
OtaGPCATh      26  --------------------------------------------------------------------
MpuGPCATh1     56  --------------------------------------------------------------------
MpuGPCATh2      9  --------------------------------------------------------------------
MspGPCATh1     43  --------------------------------------------------------------------
MspGPCATh2      9  --------------------------------------------------------------------
CreGPCATh      13  AE------------------------------------------------------------------
CowGPCATh     170  AVRDSSSHSDNPDNLQFYQQHDNEQTDRDASSIRRQQEKRASKRSVPSGADSDSEWVMSPVGSDARDLSDMDAGFTPSAS
CmeGPCATh      46  --------------------------------------------------------------------
```

```
PpaGPCATh1     2   ------------------------------------------------------------------------
PpaGPCATh2     2   ------------------------------------------------------------------------
SmoGPCATh1     9   ------------------------------------------------------------------------
SmoGPCATh2     3   ------------------------------------------------------------------------
ZmaGPCATh1     9   ------------------------------------------------------------------------
ZmaGPCATh2     9   ------------------------------------------------------------------------
OsaGPCATh      9   ------------------------------------------------------------------------
MacGPCATh1     9   ------------------------------------------------------------------------
StuGPCATh1     9   ------------------------------------------------------------------------
StuGPCATh2     9   ------------------------------------------------------------------------
RcoGPCAT       9   ------------------------------------------------------------------------
AthGPCAT       9   ------------------------------------------------------------------------
BvuGPCATh     45   --------------------SLSLPHAPLLHEKAIK---MS-------------------NSDD---------E
NnuGPCATh      9   ------------------------------------------------------------------------
EguGPCATh      9   ------------------------------------------------------------------------
NadGPCATh     10   -----------------------------------CR---IITKEKEKFG-----------EKMGQ---------E
AtrGPCATh      8   ------------------------------------------------------------------------
LtuGPCATh     16   -------------------------------KRRKKK----------KK-------GMSSESEEEAIGDDE
AfiGPCATh     10   ------------------------------S---HV-------GKKEKNPENKSREKMSK---------E
KflGPCATh      9   ------------------------------------------------------------------------
EmuGPCATh     11   ------------------------------------------------------------------------
OviGPCATh     10   ------------------------------------------------------------------------
SpuGPCATh     15   ------------------------------------------------------------------------
CgiGPCATh     16   ------------------------------------------------------------------------
LgiGPCATh1    15   ------------------------------------------------------------------------
LgiGPCATh2    18   ------------------------------------------------------------------------
LcoGPCATh     58   --------------------ML--S----------------------------------------------
MciGPCATh1    61   --------------------ML--S----------------------------------------------
MciGPCATh2    55   --------------------VL--S----------------------------------------------
MveGPCATh     80   --------------------SF-IA----------------------------------------------
UmaGPCATh     81   --------------------TY-FS----------------------------------------------
LbiGPCATh     14   --------------------TY-FD----------------------------------------------
SpoGPCATh     40   --------------------APNIY----------------------------------------------
SceGPCAT      28   --------------------PIASK----------------------------------------------
LthGPCATh     32   --------------------PLSFT----------------------------------------------
PkuGPCATh     48   --------------------PTTLN----------------------------------------------
NcrGPCATh    102   --------------------NFALP----------------------------------------------
CbaGPCATh     90   --------------------NLALP----------------------------------------------
AclGPCATh     90   --------------------NLSLS----------------------------------------------
CglGPCATh     97   --------------------NFALS----------------------------------------------
BbaGPCATh     94   --------------------NFALP----------------------------------------------
DdiGPCATh1   200   ------------------------------------------------------------------------
DdiGPCATh2    55   ------------------------------------------------------------------------
AsuGPCATh     40   --------------------ILSPS----------------------------------------------
EdiGPCATh     15   ------------------------------------------------------------------------
AcaGPCATh1    43   --------------------NLALM----------------------------------------------
AcaGPCATh2    77   ------------------------------------------------------------------------
PbrGPCATh    100   --------------------VFLRE----------------------------------------------
NgrGPCATh1    62   ------------------------------------------------------------------------
NgrGPCATh2    39   ------------------------------------------------------------------------
MbrGPCATh     45   --------------------NFG-------------------------------------------------
BsaGPCATh     79   ------------------------------------------------------------------------
OtaGPCATh     26   ------------------------------------------------------------------------
MpuGPCATh1    56   ------------------------------------------------------------------------
MpuGPCATh2     9   ------------------------------------------------------------------------
MspGPCATh1    43   ------------------------------------------------------------------------
MspGPCATh2     9   ------------------------------------------------------------------------
CreGPCATh     15   ------------------------------------------------------------------------
CowGPCATh    250   SSSEQFDQFVRRVQQGESTVDAFNQSQMP------------------------------------------
CmeGPCATh     46   ----------------------LG-----------------------------------------------
```

```
PpaGPCATh1    2  ----------------------------------------------------------------------
PpaGPCATh2    2  ----------------------------------------------------------------------
SmoGPCATh1    9  ----SP----------------------------------------------------------------
SmoGPCATh2    3  ----------------------------------------------------------------------
ZmaGPCATh1    9  ----AAVP-----------GA--P----------------------------L---VA------------
ZmaGPCATh2    9  ----AATP-----------L------------------------------------LA------------
OsaGPCATh     9  ----AAAV-----------LT--N--------------------------------GG------------
MacGPCATh1    9  ----DEGE-----------AF--QKVRH---RIA-DQS-------KR---VV------------------
StuGPCATh1    9  ----EDSN-----------GHSF-GKVKQ---RFK-DRS-------------------------------
StuGPCATh2    9  ----S--------------F--GKVKE---RFK-DRS--------------------------------
RcoGPCAT      9  ----NEFV-----SNGDSF-EKVKQ---RLK-DRS-------KK---VA--------------------
AthGPCAT      9  ----SNGL-----------DSF-DAVKQ---RFK-DRS-------KK---VV------------------
BvuGPCATh    68  KVEEVN-----------GHSF--QKVKQ---RLK-DRT-------------------------------
NnuGPCATh     9  ----DGGD-----------PF--PTVKQ---RFS-DRT-------KK---V------------------
EguGPCATh     9  ----DD-----------GEAF--RKVRQ---RIA-DQS-------KR---VV------------------
NadGPCATh    28  EGEDCD-----------AKPF--RKVRQ---KLV----------------------------------
AtrGPCATh     8  ---E--------------------AQE---AFR----------------------------------
LtuGPCATh    39  IVGGGE-----------KESFR-KAVRK---RLS-DRT-------KK---VA-----------------
AfiGPCATh    31  EVDGDR-----------GQPF--RRVKQ---RFS-DRT-------KK---VA-----------------
KflGPCATh     9  ----AEEATARSDASTSDSET--EGVRQ---RRP-GDA-------EV---LA----QEPL-----------WV---P-
EmuGPCATh    11  ----------------------------------------------------------------------
OviGPCATh    10  ----------------------------------------------------------------------
SpuGPCATh    15  ----------------------VTEVAE---QDDG--------TK--WAQ----PAKD------------
CgiGPCATh    16  ----------------------------------------------------EEE-VTY-----E-----
LgiGPCATh1   15  ----------------------------------------------------YNTG-TSR----------
LgiGPCATh2   18  --------------------VDTVVTCT-NDDG-------NTKPVAS----VTINGFIP-RSS-----S-----
LcoGPCATh    61  -----------------AA-L-EQVTH---QLN-DKQ-------RE---IR----AR-----------STEWTTKTK-
MciGPCATh1   64  -----------------AA-L-DQVTN---QLE-DKQ-------RE---FI-----SK-----------SSEWTNKTR-
MciGPCATh2   58  -----------------AA-L-EQVTL---QIR-DVK-------NE---IK----AL---------LSTEWTSMTQ-
MveGPCATh    84  -----------------QN-L-EEELT---DLP-VLANQIYKTLRQD---LK----KNKQ---K-LKHQM-------K-
UmaGPCATh    85  -----------------PR-I-DLAGR---KWS-AFS----GDMRSR---AR----RRRE---E-LVRKA---------
LbiGPCATh    18  -----------------SR-V-DLVQR---KLQ-KHS-------DR---LK----MKAE---E-TFKIK-------E-
SpoGPCATh    45  -----------------RV-Y-SWVHK---HYN-QKK-------GQ---LKHGVSRQKN---K-L------------
SceGPCAT     33  -----------------VV-S-KYYHG---SHLSKAE-------QK---LR----NFEG---F-RRRKPHHEHD-SH-
LthGPCATh    37  -----------------AQ-S-QYVPR---KYLTRAR-------RR---LK----S------------ARPRQ-KL-
PkuGPCATh    53  -----------------LE-L-RKKKD---DTYKWVR-------KV---YN----DK------------------
NcrGPCATh   107  -----------------QQ-L-EKVQR---GIH-ART-------EK---MR----KSGE---A-LKEKSAIARERMV-
CbaGPCATh    95  -----------------AK-L-EKWQA---TLQ-AQK-------EK---LA----RQQE---R-IRSSGNNAKDRAM-
AclGPCATh    95  -----------------QK-L-EKWQH---AIN-VQK-------EK---VR----KQRE---K-LKYTSMHAKDRVV-
CglGPCATh   102  -----------------QQ-L-EKVQK---GIS-AQT-------EK---VR----KSRQ---A-FGNKSRIARERMV-
BbaGPCATh    99  -----------------QQ-L-EKVQK---GIS-AQT-------DK---VR----RSRD---A-LKSKTQTARHRMV-
DdiGPCATh1  200  ------------------KVVQQ---RHS-AIN-------NR---LQ----R--------------L-KKVVD
DdiGPCATh2   55  ----------------P-T-SNFK---------------------------------------------
AsuGPCATh    45  ----------------SP-I-GQFKK---SID-DRR-------------------L-------------
EdiGPCATh    15  ----------------------------------------------------------------------
AcaGPCATh1   48  ----------------RE-L-DAVAD---ALQ-SLP-------V-------------------------GFK-
AcaGPCATh2   77  ----------------RKVID---KLK-T-S-------PH---VK----R--------------------
PbrGPCATh   105  ----------------VR-L-ENVQT---TLE-TG-------------------R-GA---GLVRD-------AR-
NgrGPCATh1   62  ----------------ETVGS---SLQ-NQE-------EE---LI----DLWM----RINDAFSDRKKSLVN
NgrGPCATh2   39  -----------------------------------N--------NT---TT----TTSS----SP-----------KQ
MbrGPCATh    48  ----------------AAPLSVNVMR---RLT-IL-----------------------------------R-
BsaGPCATh    79  ----------------------------------------------------------------------
OtaGPCATh    26  ----------------------AVAR---AIR-RK-------------------SG---ELLKS--------AK-
MpuGPCATh1   56  ----------------------RGVGQ---FFK-RP----------------VE---NV--------------
MpuGPCATh2    9  ---PNKV----------A--------------------------------------------------
MspGPCATh1   43  --------------------RPRRP---SLP-EG---------------------AR---AI--------------
MspGPCATh2    9  ----RSSE----------E---------------------------------------------------
CreGPCATh    15  ----------------------------------------------------------------------
CowGPCATh   279  ----------------RS-R-RPSAA---HLD-RES-------EQ---AR----RLQK----SMSTSSI--GDRLID
CmeGPCATh    48  ----------------S-L---------------------------------------------------
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PpaGPCATh1    2  --------------------------------------------------------------TK-E
PpaGPCATh2    2  --------------------------------------------------------------TK-E
SmoGPCATh1   11  --------------------------KLAAA----------RR------------------SEVAA-R
SmoGPCATh2    3  --------------------------------------------------------------TK-K
ZmaGPCATh1   19  ----------------------NGAADVR----------RR----------------RDQAK-A
ZmaGPCATh2   16  ----------------------NGAADVR----------RR----------------RDQAK-A
OsaGPCATh    18  ----------------------AGAAEVR----------RR----------------RDQAK-E
MacGPCATh1   30  ----------------------QTKEILS----------KQ----------------AAQTK-E
StuGPCATh1   28  ---------------------------Q-----------KT----------------KEKTK-Q
StuGPCATh2   22  ---------------------------K-----------KT----------------KERTK-Q
RcoGPCAT     34  ----------------------QTKEILS----------KQ----------------ANQTK-E
AthGPCAT     31  ----------------------QTRELLS----------KQ----------------AVQTR-E
BvuGPCATh    89  -------------------------KRVS----------ET----------------KEKTK-K
NnuGPCATh    29  -----------------------TKEIIS----------KQ----------------AVQTK-E
EguGPCATh    30  ----------------------QTKEILSKQAV------QT----------------KEKTK-E
NadGPCATh    46  ----------------------FHRVKGL----------KT----------------VVQTK-E
AtrGPCATh    15  ---------------------RARIRIM----------AK----------------KAKTK-E
LtuGPCATh    65  ----------------------QTKEILS----------KQ----------------AVQTK-E
AfiGPCATh    56  ----------------------QTRELLSKQAVQTKEILSKQ--------------AVQTK-E
KflGPCATh    48  -PRR----------------VNSRELVA----------KH----------------VKKIR-M
EmuGPCATh    11  -----------I----------Y---------------------------------RST-L
OviGPCATh    10  -------------------------------------------------------------
SpuGPCATh    34  --V--------I----------R--------------------------------DSG-S
CgiGPCATh    23  -SSGPQVKPHQWVE----------ARN---TN----------G----------------K--LHKLK-S
LgiGPCATh1   23  -SG--------V----------EKHIKKMS----------D----------------R--MKQVK-A
LgiGPCATh2   49  -IG--------I----------EPTKSTL----------D----------------K--LEITE-S
LcoGPCATh    90  -EK--------L----------RRQTARLE----------D----------------Q-KTRLQ-A
MciGPCATh1   93  -DS--------I----------KTQTKKLE----------D----------------Q-RSRIQ-E
MciGPCATh2   88  -GR--------L----------RRKQKILLE----------A----------------R--KAMIQ-D
MveGPCATh   121  -HQ--------M----------GSTKAQFD----------K----------------Q--RGHLK-S
UmaGPCATh   117  --R--------S----------KRELQQMD----------D----------------E--LTKMR-L
LbiGPCATh    47  -LS--------G----------DALAENLE----------D----------------E--IKNLK-L
SpoGPCATh    73  --------------------QPIHKQIN----------Y----------------E--TDKLK-E
SceGPCAT     69  -HP--------H----------HLNRSRSF----------L----------------Q-LEDFK-V
LthGPCATh    64  -NQ--------L----------KTTAQDIT----------P----------------Q-LEDFK-R
PkuGPCATh    74  --K--------K----------SANINLSK----------E----------------D--LKEIK-R
NcrGPCATh   143  -DE--------W----------RKRVPTAE----------E----------------Q--LERYK-K
CbaGPCATh   131  -AE--------W----------RKRVPPAD----------E----------------Q--LAKYR-S
AclGPCATh   131  -GE--------W----------KRRVPTAD----------E----------------Q--LDKYR-H
CglGPCATh   138  -DE--------W----------RRRVPSAE----------E----------------Q--LDRYR-K
BbaGPCATh   135  -EE--------W----------RRRVPSAD----------E----------------Q--FDRYR-K
DdiGPCATh1  222  PKK--------L----------RERGKILK----------NEKEKI------------------K-S
DdiGPCATh2   61  -RR--------V----------AESK-IVK----------K----------------LKVLEFVN-E
AsuGPCATh    59  -HR--------F----------VDQK-MLA----------K----------------LKVLEFVN-S
EdiGPCATh    15  ------------------RQYIS----------RLMDKH------------------GL-S
AcaGPCATh1   66  -EK--------M----------DSH-------------------------------REKLA-H
AcaGPCATh2   92  ------------------ATEFVG----------SGTNKLRERLI------------NQ-Q
PbrGPCATh   128  -KH--------I----------QDQIR----------R----------------Q--RHKIR-D
NgrGPCATh1   96  --K--------F----------QGISNNLK----------RELENQ-----------------K-L
NgrGPCATh2   52  --G--------P----------QQATPKPS----------STLVNV-----------------S-S
MbrGPCATh    64  -KR--------L----------ATSQDKMR-----QRLSSN------------------N--LNSLRRK
BsaGPCATh    79  -----------------------------------SSSSK------------------
OtaGPCATh    44  ------------------------EETS----------R----------------R-GKSAVR-R
MpuGPCATh1   70  ------------------------G----------R----------------A-AKRRLR-A
MpuGPCATh2   14  --------------------RTLCA----------P----------------AEV--A
MspGPCATh1   57  --------------------P----------E----------------G-ARNFVR-A
MspGPCATh2   14  --------------------E------------------------------------N
CreGPCATh    15  -------------------------------------------------------------
CowGPCATh   314  --K----------FSEIRDKGGDVRSAVRHLVA----------HEKERLQHLISKHRDRIRERQLELAHH--QAKVK-A
CmeGPCATh    50  -------------------------ANLD----------D----------------K--IRNTK-H
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PpaGPCATh1    5 LI---TK--Q-A-------TV---------IA--KR-A--DEHEDFLTKVVT-------------------------------
PpaGPCATh2    5 II---KK--Q-A-------TV---------IS--KS-A--DEHEDFLAK-IM-------------------------------
SmoGPCATh1   24 FT---SE--R-A-------SI---------IS--RR-A--DEHEQLLNK-VT-------------------------------
SmoGPCATh2    6 IL---SK--H-A-------GK---------LA--TR-A--DKHEKFINK-VK-------------------------------
ZmaGPCATh1   34 IL---SK--Q-A-------VK---------IA--TK-A--EQHERFIFK-VT-------------------------------
ZmaGPCATh2   31 IE---ST--Q-A-------VR---------IA--TK-A--EQHERFIFK-VT-------------------------------
OsaGPCATh    33 IL---SK--Q-A-------VK---------IA--TK-A--EEHERFIFK-VT-------------------------------
MacGPCATh1   45 IL---SK--Q-A-------VK---------IA--KQ-A--EEHERILFK-VT-------------------------------
StuGPCATh1   37 IL---SK--Q-A-------AQ---------IA--KR-A--EEHERFINK-VT-------------------------------
StuGPCATh2   31 ML---SK--Q-A-------VK---------IA--QR-A--EEHEPFINK-VT-------------------------------
RcoGPCAT     49 IL---SK--Q-A-------VK---------IA--KQ-A--EEHESFINK-VT-------------------------------
AthGPCAT     46 IL---SK--Q-A-------VK---------IA--KQ-A--EEHERFINK-VT-------------------------------
BvuGPCATh   101 II---SE--H-A-------ER---------IA--KQ-A--EEHERFINK-VT-------------------------------
NnuGPCATh    43 IL---SK--Q-A-------VK---------IA--RQ-A--EEHERFINK-VT-------------------------------
EguGPCATh    49 IL---SK--Q-A-------VK---------IA--KQ-A--EEHERILFK-VT-------------------------------
NadGPCATh    61 IL---SK--Q-A-------KR---------IA--KQ-A--EEHERFINK-VT-------------------------------
AtrGPCATh    30 IL---SK--Q-A-------VK---------LA--KQ-A--EEHERFINK-VT-------------------------------
LtuGPCATh    80 IL---SK--Q-A-------VK---------IA--KQ-A--EEHERFINK-VT-------------------------------
AfiGPCATh    82 IL---SK--Q-A-------VK---------IA--KQ-A--EEHERFINK-VT-------------------------------
KflGPCATh    67 EA---AK--N-V-------EK---------IQ--HH-T--EEHDRFYTK-LT-------------------------------
EmuGPCATh    17 KL--M-S--T-T-----------------ERK-R--LIPPVLINK-IT----------------------------------
OviGPCATh    10 -----------------------------------GCRMFSEK-IC------------------------------------
SpuGPCATh    41 VA--E-H--R-LNEIEQPYHEVQAVESKPQLG-CKD-R--LNKSNCPEK-MV------------------------------
CgiGPCATh    49 VLLVLIM--EES--V-QSSVPYKQLEAG-SKTNALK-E--WKKSRIIEK-FV-----------------------------
LgiGPCATh1   42 HL---SL--E-E-------QD---------LREFLL-V--LKKKRLQEK-IV------------------------------
LgiGPCATh2   67 GT---SQ--EEE-------SE---------LAAFLS-L--LKRKRLQEK-IV------------------------------
LcoGPCATh   109 QL---LK--K-Y-------DA---------IEVRMNRD--AKTVRLRDK-IS------------------------------
MciGPCATh1  112 LI---VR--Q-Y-------HK---------IDKRMNRD--AKTVQLRDK-VS------------------------------
MciGPCATh2  107 RL---LN--Q-Y-------GT---------IRTRMHRD--ANAVRLHDK-VS------------------------------
MveGPCATh   140 QL---DT--S-L-------AV---------WEKNMQ-K--ASVVRFMDK-VA------------------------------
UmaGPCATh   135 RV---SK--R-I-------EN---------LQQKWM-D--AKVVRLRDK-IS------------------------------
LbiGPCATh    66 KV---ST--R-M-------AT---------LSASWQ-S--AKVVRTRDK-VS------------------------------
SpoGPCATh    89 RL---GK--S-I-------DK---------FQEQWN-S--GKVVRFRDK-LS------------------------------
SceGPCAT     88 RA---LQ--R-I-------RN---------LDKPLD-SIFFKNSSRLEK-AF------------------------------
LthGPCATh    83 RT---IE--R-L-------HS---------LDRPLE-SLFFHNSSRLEK-WF------------------------------
PkuGPCATh    92 FL---HI--K-L-------DQ---------VYLKVN-E--TEKASSTEK-IF------------------------------
NcrGPCATh   162 RV---RV--N-V-------DK---------LGKRWN-D--TKVITLREK-VA------------------------------
CbaGPCATh   150 RV---KK--S-V-------DD---------LSKRWN-E--VVTISIREK-VS------------------------------
AclGPCATh   150 RV---KD--G-V-------KR---------LEKQWN-A--TATVTLREK-VS------------------------------
CglGPCATh   157 RV---RT--S-V-------EK---------LGSRWN-D--TKAITLREK-IS------------------------------
BbaGPCATh   154 RV---RQ--R-V-------DK---------LGRQWN-D--TKAISLREK-IS------------------------------
DdiGPCATh1  242 LI---KL--K-K-------VQ---------LDDHMN-A--PPFIRLLDK-CA------------------------------
DdiGPCATh2   81 KR---EE--F-Q-------RD---------LYKDGR-A--SQLIRTKDK-FS------------------------------
AsuGPCATh    79 RR---EE--F-E-------Q----------LLLKKG-A--SDLLRTGDK-LA------------------------------
EdiGPCATh    29 FL---DK--Y-Q-------NK---------LNKLME-S--EPFLKTLDK-VS------------------------------
AcaGPCATh1   78 KL---ET--R-L-------KS---------VKDGMQ-R--APFIKTRDK-FS------------------------------
AcaGPCATh2  112 YL---DK--K-E-------KE---------LKEKMN-M--PPFVRTIDK-IG------------------------------
PbrGPCATh   144 KL---LQ--S-R-------LA---------WQKKTL-D--PPFCRFIDK-MS------------------------------
NgrGPCATh1  114 QL---KQ--K-K-------ET---------LVREMN-Q--PENVKTKDK-YA------------------------------
NgrGPCATh2   70 SL---RK--R-Y-------KI---------LKNL---P--NFSVSFSDK-IA------------------------------
MbrGPCATh    89 ML---TG-NP-H-------KR---------VRDFVK-E--EPVVKTIDK-FS------------------------------
BsaGPCATh    84 ------------------------------FDSQGG-K--LQDVRTKDK-VV------------------------------
OtaGPCATh    57 AV---TG--SAE-------TR---------VRDFVK-I--PRVIRQIDK-VS------------------------------
MpuGPCATh1   80 RV---TGDPTGE-------TR---------VREYVK-L--PRTIQLIDK-LS------------------------------
MpuGPCATh2   24 GL---RR--A-L-------DI---------VRATRD-V--YKTQQGLSQ-LT------------------------------
MspGPCATh1   67 KL---TG--DPR-------VR---------VRDYVK-M--PRTIQTIDK-VS------------------------------
MspGPCATh2   16 GL---RR--A-L-------EI---------VKKQGD-F--YKRQQGLSP-LS------------------------------
CreGPCATh    15 -----------------------------L--EAAEAAEGK-ADGMAAVVGASGGAEPGGAASDGADFGSES
CowGPCATh   368 DF---DR--R-R-------QA---------WEERVS-K--PPFLRLIDK-IC------------------------------
CmeGPCATh    62 RL---VE--R-R-------RA---------IERRVR-T--PEVIRLRDK-LS------------------------------
                                                                 |Start of DUF2838
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PpaGPCATh1   30  ------------YCIGVVSFGTFCYL-----LGSKPADIPKLYC-LFFITVAPLRWIYYRIKKWHYYL----------
PpaGPCATh2   29  ------------YCLGVVSFGTFCFL-----LGSRPDAIPKLYC-LFFITVAPLRWIYYFMKKWHYYF----------
SmoGPCATh1   48  ------------YCLGVFCFGTVCYV-----MGSRPHEIPYLYC-LFFIGIAPLRWIYYRTKKWHYYL----------
SmoGPCATh2   30  ------------YCLGVFCFGTFCYL-----LGSRPQDIPYLYC-TFFITVAPLRWIYYRIKKWHYYL----------
ZmaGPCATh1   58  ------------HLIGVIGFGGFCYL-----LGARPQDVPYVYC-LFYVIFVPLRWIYYRYKKWHYYL----------
ZmaGPCATh2   55  ------------HLIGVIGFGGFCYL-----LGARPQDVPYVYC-LFYVIFVPLRWIYYRYKKWHYYL----------
OsaGPCATh    57  ------------HLIGVIGFGTFCYL-----LGARPQDVPYVYC-LFYVIFVPLRWIYYRYKKWHYYLLFSYGYYNREE
MacGPCATh1   69  ------------HLIGVIGFGAFCFI-----LGARPQDVPYVYC-FFYVTFVPLRWIYYRYKKWHYYL----------
StuGPCATh1   61  ------------HLMGVIGFGAFCFI-----LGARPKDIRYVYC-LFYVIFVPLRWIYYRYKKWHYYL----------
StuGPCATh2   55  ------------HLIGVIGFGAFCFI-----LGARPQDIRYAYS-FFYVIFVPLRWIYYRFKKWHYYL----------
RcoGPCAT     73  ------------HLIGVIGFGGFCFL-----LGARPQDIPYVYC-IFFFIFVPLRWIYYRFKKWHYFL----------
AthGPCAT     70  ------------HLVGVIGFGGFCFL-----LGARPQDIPLVYC-FFYVIFVPLRWIYYRFKKWHYFL----------
BvuGPCATh   125  ------------YILCGVIGFGGFCFL-----LGARPQDVPYVYC-LFYVIFVPLRWIYYKYKKWHYYL----------
NnuGPCATh    67  ------------HLIGVIGFGAFCFL-----LGSRPQDVPYVYC-FFYVIFVPLRWIYYRFKKWHYYL----------
EguGPCATh    73  ------------HLMGVIGFGAFCFI-----LGARPQDVPYVYC-LFYVTFVPLRWIYYRYKKWHYYL----------
NadGPCATh    85  ------------HLIGVIGFGAFCFL-----LGSRPQDIPYVYC-VFYVTFVPLRWIYYRFKKWHYYL----------
AtrGPCATh    54  ------------HLIGVIGFGAFCFL-----LGSRPQDIPYIYC-LFYVTFVPLRWIYYRFMKWHYYL----------
LtuGPCATh   104  ------------HLIGVIGFGAICFL-----LGARPQDIPYVYC-LFFVTFVPLRWIYYRFKRLHYYL----------
AfiGPCATh   106  ------------HLIGVIGFGSFCFL-----LGARPQDIPYVYC-LFFVTFVPLRWIYYRFKKWHYFL----------
KflGPCATh    91  ------------YSLGVICFGLIFCFL-----VGAKPQVIPYFYC-FFLFVALPLRWMYYRAKKWHYFL----------
EmuGPCATh    38  ------------FVLSVTLLTVFVFC------AVFSPPAIFLILT-ILFVILMIFRVIAYTRSNNILFM----------
OviGPCATh    20  ------------FVCATAFIVLSTYF------FVVRPALILYIFS-GFFVVAMVFRVLNYWRSNYLLFM----------
SpuGPCATh    82  ------------FVVSILTVIVVCCS------MMSFQWFIPYLYT-AYLSVLIPIRAYKYTNLKWQFFL----------
CgiGPCATh    91  ------------YVVAVITIIFLTHA------TVYAQWLIPYYYA-VSTPILILRVIMYWKNKWQYFL----------
LgiGPCATh1   68  ------------YVISIGTIILLTHS------LMASQWLIPYYYT-ISTPCLLLIRTIIYWKYKWNYFL----------
LgiGPCATh2   94  ------------YVISIGTIILLTHS------LMASQWLIPYYYT-ISTPCLLLIRTIIYWKFRWHYFL----------
LcoGPCATh   136  ------------FVVGVGNACVSPAI------AARLPTWIPLYYT-IQSIYLISLRYLIYKVKKWHYFI----------
MciGPCATh1  139  ------------FVVGVGNACVAPAI------ALRYPSLIPSYYS-SQLIVLLILRYVIYRSKRWHYFI----------
MciGPCATh2  134  ------------FVVGVGNTCITPVI------AARLPVWIPIYYT-VQLCYLITLRFFVYKSKQWHYFF----------
MveGPCATh   166  ------------FTLGVFECCCTPNL------VAQYPEWIPLVHT-VQVATLIMRYFLYKKKSWHIFL----------
UmaGPCATh   161  ------------FVVGVCNLVVSSLV------FALRPELIPTLYS-LLAIYFIPLRVWSYTSKKWHYFL----------
LbiGPCATh    92  ------------FFFGVVSLLLSALL------FGIAPHWVHVAYS-VQGLYLILPYLRAYRYKFRAWHYFL----------
SpoGPCATh   115  ------------FALGVSTCILTALL------VGMAPESMHLWYT-IQLFVYLPLRYYTYQRKGYEYFI----------
SceGPCAT    116  ------------YPFTIFNIFFIGEL-----MGRFPEWFHVYYT-ILFFVLMPIRFYTYYKTKNHYFL----------
LthGPCATh   111  ------------YPFTIFHIFAIGFI-----IGKYPSWFHVYYT-GMLVLLMPVRFYTYYKTNNHYYM----------
PkuGPCATh   118  ------------FSFSVYMIFFIGXL-----IGHSPEYIHILYS-VMFAILMPIRLLTYYKRDYGYFL----------
NcrGPCATh   188  ------------FTFGVVNIFISGYL-----IGAFPEWFHIWYT-VQILYFMPIRFYRYFKQGYHYFL----------
CbaGPCATh   176  ------------FISAVINVFLSGYL-----VGAVPQYFYWWYT-IQLIYFMPIRAYTYERRGYHYFL----------
AclGPCATh   176  ------------FIAGVVNIFISGYL-----IGAYPEYFYIWFS-VQLAYFWIPIRYYGYYKKGYHYFL----------
CglGPCATh   183  ------------FICGVVNIFVSGYL-----IGGYPEYFHLWYT-IQVIYFMPIREYYYFKKGYHYFL----------
BbaGPCATh   180  ------------FICGVMNIFISGYL-----IGGYPEYFHLWYT-VQLVYFMPIRMFTYFRRGYHYFL----------
DdiGPCATh1  268  ------------FTVGLIILMVSEFV-----ILKSPQLFYLWYT-VLIFPLMAIRFVMYFREKYHYFM----------
DdiGPCATh2  107  ------------FVLGVINLCVISFV-----CGKYPLYIQYFFS-GEYIVLFATRIILYKRKKLHYFL----------
AsuGPCATh   104  ------------FVNGVLNLCIISFV-----YGRAPKYIPDVFA-VEFCLGFILRLYSYFKKKQHYFL----------
EdiGPCATh    55  ------------FVCGVLTILLTQHL-----LSALPQFIPYYYV-ILIFPLIGARYFIYKKNGWQYFL----------
AcaGPCATh1  104  ------------FVCGVTNVALTFLL-----LGRHPEWIPIYYT-IKAFLLLTILRWVYFKGKYHYFL----------
AcaGPCATh2  138  ------------FMMGIILMLVTEAL-----L-TKPNAMYQFYT-VLMFPLMVFRFASYFRMKWHYFM----------
PbrGPCATh   170  ------------FTVGLIGSLITVCL-----LGRSSDLVVKWYT-YLIVLLISLRIYLYRKEGYQYFL----------
NgrGPCATh1  140  ------------FTIGVIIMVSSTEL-----LAKYPYLIPDYYI-VMSVILMVLRFFHYFGMGFHYFM----------
NgrGPCATh2   94  ------------FTVGVLLIVSTTYL-----FGHSPKYIPIWYI-LWMIPLMIYRFIDFFSQHAHYFM----------
MbrGPCATh   116  ------------FVAGVSTMLALEYF-----LLQETRYIPYFYV-ALMFPLLMARWFLYFKAGWQYFL----------
BsaGPCATh   102  ------------YTISVINAVLTAFL-----FGVVPHYFHWWHS-PKAIMYIAHRWYTFRKQNQHYLL----------
OtaGPCATh    84  ------------FCVGVFGIMMTEYV-----ATRAPEKFWMFYA-FAMPAIVCVRAVYYFMIEWQYFL----------
MpuGPCATh1  109  ------------FTGGVIGLMITQHV-----ATTRPGLFWLYYL-VVAPFVFANRVATYTAMKYHYFL----------
MpuGPCATh2   50  ------------FFGVMNVFLTAFI-----LGNTPEYYWVWQL-LKNVAVSTASYVIKYRNHQRLYL----------
MspGPCATh1   94  ------------FTLGVVGIMLTQFV-----ATEHPEYFWFYYL-CSAPLVFIYRILMYFMIKYHYFL----------
MspGPCATh2   42  ------------FALGLFNVGWSAFC-----LGRFVQYYWVWQV-VKSVMLNYLSYSIKLKNHQRLYL----------
CreGPCATh    55  GAESEDVVEFLDATDGGPGLVMAEAVLDMHEVFHELPEQLAALQVGLGEAVTP---------QKRRR----------
CowGPCATh   394  ------------FTGFVASFLVTEFL-----LLRYPQWIWLWYA-VCIIPLVGTRYVLYFREQWHYFL----------
CmeGPCATh    88  ------------FVIGLLINVLFTEYV-----ILRQPARIWQWYL-YQLTPLLILRYYSYRKSAQHYFM----------
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PpaGPCATh1    80  ---------LDFCYYANAIFVV------ML-LF-----------------Y------P-T--ND----KLFLICFSFSEGP
PpaGPCATh2    79  ---------FDFCYYANTIFVV------ML-LY-----------------T------P-K--ND----KLFLVCFSFAEGP
SmoGPCATh1    98  ---------LDFCYYANAVIFMA-----ML-LV-----------------T------P-N--NE----KLFMVCFSFSEGP
SmoGPCATh2    80  ---------FDFCYYANAIFMA-----ML-LY-----------------T------P-K--NE----RLFMVCFAFAEGP
ZmaGPCATh1   108  ---------LDFCYYANTFLLV-----MI-LF-----------------Y------P-K--DE----KLFMVCFSFAEGP
ZmaGPCATh2   105  ---------LDFCYYANTFLLV-----MI-LF-----------------Y------P-E--DE----KLFMVCFSFAEGP
OsaGPCATh    118  ALQFQAIDCLDFCYYANTFLLV-----MI-LF-----------------Y------P-K--DE----KLFMVCFSFAEGP
MacGPCATh1   119  ---------LDFCYYANTFFLV-----ML-LF-----------------T------P-K--NE----KLFMVCFSFAEGP
StuGPCATh1   111  ---------LDFCYYANTIFLV-----TL-LF-----------------Y------P-T--KE----KLFMVCFSFAEGP
StuGPCATh2   105  ---------LDFCYYANTIFII-----ML-LG-----------------T------P-T--NE----TFFMVCFSFAEGP
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RcoGPCAT (highlighted green)
```
RcoGPCAT     123  ---------LDFCYYANTIFLV-----DL-LL-----------------Y------P-K--DE----KLFMVCFSFAEGP
```
AthGPCAT (highlighted green)
```
AthGPCAT     120  ---------LDFCYYANTIFLV-----DL-LL-----------------Y------P-K--NE----KLFMVCFSFAEGP
BvuGPCATh    175  ---------LDFCYYANTIFLV-----AL-LM-----------------Y------P-K--NE----KLFMVCFSFSEGP
NnuGPCATh    117  ---------LDFCYYANTLFLV-----ML-IL-----------------Y------P-R--NE----KFFMVCFSFAEGP
EguGPCATh    123  ---------LDFCYYANTIFII-----VL-LF-----------------T------P-K--NE----KLFMVCFSFAEGP
NadGPCATh    135  ---------LDFCYYANTIFLV-----ML-LL-----------------Y------P-K--NE----KLFMVCFSFAEGP
AtrGPCATh    104  ---------LDFCYYANTIFLF-----ML-LL-----------------Y------P-R--NE----KLFMVCFSFSEGP
LtuGPCATh    154  ---------LDFCYYANTIFLV-----ML-LF-----------------Y------P-R--NE----KLFMVCFSFAEGP
AfiGPCATh    156  ---------LDFCYYANTIFLV-----ML-LF-----------------Y------P-R--NE----KLFMVCFSFAEGP
KflGPCATh    141  ---------LDFCYYANAIFVF-----LL-LV-----------------Q------P-D--NE----RLFMICFAFSEGP
EmuGPCATh     88  ---------LGPCYEVNVYTLI-----FI-WA-----------------V------P-D--SR----PVFLVEGLANST
OviGPCATh     70  ---------LDTCYLINLISLC-----LI-WA-----------------T------P-T--CH----KIQRIQFGLANAH
SpuGPCATh    132  ---------ADVCYVANAMSIL-----FL-WA-----------------A------P-Y--KS----NYFMIVFGVTNGP
CgiGPCATh    141  ---------LDFCYYANILWYS-----FIWWV-----------------V------P-Y--NE----KFFAVVFALSNGP
LgiGPCATh1   118  ---------LDFCYYGNVLWYL-----FL-WI-----------------W------P-Q--HG----NIFVASEAVANGP
LgiGPCATh2   144  ---------LDFCYYGNILWFA-----FI-WI-----------------A------P-H--HG----DLFSVAFAIANGP
LcoGPCATh    186  ---------FDLCYEVNAMTLL-----FL-WV-----------------T------P-G--SR----AMFIATYCLTNGP
MciGPCATh1   189  ---------FDLCYEVNAMTML-----FL-WA-----------------Y------P-T--SK----LLFVASFCMTNGP
MciGPCATh2   184  ---------FDLCYYVNLLTLL-----FL-WV-----------------T------P-S--ST----LLYTAAFTLTNGP
MveGPCATh    216  ---------LDMCYEVNVAVIL-----YL-YV-----------------T------P-Q--SQ----ALLGAVWLLSLGP
UmaGPCATh    211  ---------FDFCYELNVANLL-----FI-WV-----------------T------P-S--SE----FLFTVCYCAAHGP
LbiGPCATh    142  ---------FDLCYYVTILNFV-----YI-WL-----------------T------P-S--SP----ALFVACYCLSHGA
SpoGPCATh    165  ---------ADFCYWGNILLLV-----YI-WI-----------------T------P-E--SR----RLFIISYSISYGT
```
SceGPCAT (highlighted green)
```
SceGPCAT     166  ---------ADFCYEVNMICLL-----FI-WI-----------------T------P-Y--SY----SLFQSCFAFTFGT
LthGPCATh    161  ---------ADLCYYVNLMVLL-----FV-WV-----------------W------P-D--SV----HLYQSCFAFTFGT
PkuGPCATh    168  ---------ADLCYYVNYLLLI-----YI-WI-----------------L------P-D--SQ----SLYIACCSSWGS
NcrGPCATh    238  ---------ADLCYEVNFLLLL-----SL-WV-----------------T------P-G--SK----RLFTAVYCLAYGN
CbaGPCATh    226  ---------ADLCYEVNFILLS-----SI-WA-----------------T------P-R--SK----RLFISAVCLAYGN
AclGPCATh    226  ---------ADLCYEVNMLCML-----SI-WV-----------------T------P-R--SK----RLFISTFCLTFGN
CglGPCATh    233  ---------ADLCYEVNFLCML-----SI-WA-----------------T------P-N--SK----RLFTAVYCLAFGN
BbaGPCATh    230  ---------ADLCYEVNVLLML-----SL-WA-----------------T------P-S--SK----RLFTAAFCLAFGN
DdiGPCATh1   318  ---------LDFCYLCQILLLF-----YL-FG-------HQYILGEK-V--IP----NLFKLVFALSNGP
DdiGPCATh2   157  ---------FDFCYFANLMLLF-----FI-YG-----------------L------P-D--RQ----WYFITCFCIANGP
AsuGPCATh    154  ---------FDYCYYANFMLLW-----YT-HGPE------------YV------R-S--ST----VLFKICFSFCNGP
EdiGPCATh    105  ---------LDFCYFCQIITLI-----CI-FS-----------------L------N-TEYIS----PLFQIAFVFSHGP
AcaGPCATh1   154  ---------FDFCYYANILVLL-----YL-HF-----------------T------P-K--SE----TMFIICFAFCTGP
AcaGPCATh2   187  ---------LDFCYYCQILLLF-----FI-YW-----------------H------S-S--NP----IYFQFVFCLSNGP
PbrGPCATh    220  ---------LDFCYFTTGIVYM-----YL-YL-----------------Y------P-K--SS----TLFVHVFAFANGP
NgrGPCATh1   190  ---------LDFCYIANFILIF-----YL-GF-----------------Y------T-N--SP----HLFLINFVNSSGP
NgrGPCATh2   144  ---------LDFCYMCNLALMF-----FL-FF-----------------T------P-T--SP----HLFVITEANNCGP
MbrGPCATh    166  ---------ADFCYELNWLTML-----CI-LL-----------------P------SVF-GA----TARRISFVMCHGP
BsaGPCATh    152  ---------YDFCYYANGITLL-----YC-WV-----------------C------E-W--SD----VLFQILFVCSNGP
OtaGPCATh    134  ---------YDFCYFANVSVLV-----FL-WT-----------------R------R-R--SA----TAFRCIFAFANGP
MpuGPCATh1   159  ---------LDFCYYANVCFA------QI-LV-----------------N------P-G--SA----RLFRTTEAMATGP
MpuGPCATh2   100  ---------LDLCHVLGFFYIV-----IA-FAGLLASASPHLHAIFAPF------T-S--SK----LLFITAFGIANGP
MspGPCATh1   144  ---------LDFCYYANLACFV-----HI-LG-----------------A------P-T--SG----RLFRSVTAYSNGP
MspGPCATh2    92  ---------MDLCHWLSFAYSIVGSISLAA-WAIP------GLKEGLAPV------T-S--SP----YVFRACFCLANGP
CreGPCATh    114  ---------YDFCYYANLILVL-----QI-WL-----------------L------P-R--WA----PIA---------
CowGPCATh    444  ---------LDYCYFAQCILLF-----YL-FF-----------------Y------P-T--SG---QLFELVFSSMNGP
CmeGPCATh    138  ---------YDYCYFVQAILVA------FY-FG-----------------W------P-R--IQAWRQVMFVALFASANGP
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PpaGPCATh1   115  LAWALIVWRCSLVFSSIDKIISVLIHLLPG----TVFEIIRWWDP-ITFAH----------------------------
PpaGPCATh2   114  LAWALIVWRCSLVFSSFDKLVSVLIHLLPG----LVFYIIRWWDP-ASFSH----------------------------
SmoGPCATh1   133  LAWALIVWRCSLVFSSIDKIISVLIHLLPGKFHSTVFEIIRWWDP-ITYPH----------------------------
SmoGPCATh2   115  LAWALIIWRCSLVFSSIDKIISVLIHLLPG----LVFEIVRWWDP-STFSL----------------------------
ZmaGPCATh1   143  LAWALIVWRCSLVFGSFDKLVSVLIHLLPG----LVLETIRWWDP-QTFAA----------------------------
ZmaGPCATh2   140  LAWALIVWRCSLVFSSFDKLVSVLIHLLPG----LVLETIRWWNP-QTFAA----------------------------
OsaGPCATh    162  LAWALIVWRCSLVFSSFDKLVSVLIHLLPG----IVIETIRWWNP-QTFAA----------------------------
MacGPCATh1   154  LAWALIVWRNSLVFSSIDKLVSVLIHLFPG----IVFETIRWWNP-ETFAA----------------------------
StuGPCATh1   146  LAWALIVWRCSLVFSSVDKIVSVFIHLLPG----LVFETIRWWDP-EFFGA----------------------------
StuGPCATh2   140  LAWALIVWRCSLVFSSVDKTVSVFIHLLPG----LVFETIWWWDP-VFFGA----------------------------
RcoGPCAT     158  LAWALIVWRCSLVFSSVDKIVSVLIHLLPG----LVFETIRWWNP-ATFEA----------------------------
AthGPCAT     155  LAWALIVWRCSLVFSSPDKIVSVLIHLLPG----LVFETIRWWNP-ATFAA----------------------------
BvuGPCATh    210  LAWALIVWRCSLVFNSIDKITSVLIHLLPG----LVFETIRWWNP-STFAA----------------------------
NnuGPCATh    152  LAWALIVWRCSLVFSSPDKIVSVLIHLLPG----IVFETIRWWDP-ATFEA----------------------------
EguGPCATh    158  LAWALIVWRCSLVFGSIDKIVSVLIHLLPG----LVFETIRWWNP-ETFAA----------------------------
NadGPCATh    170  LAWALIVWRCSLVFSSVDKIVSVLIHLLPG----LVFETIRWWDP-STVAD----------------------------
AtrGPCATh    139  LAWALIVWRCSLVFSSIDKIVSVLIHLLPG----IVFETIRWWDP-TRLGD----------------------------
LtuGPCATh    189  LAWALIVWRCSLVFSSVDKIVSVLIHLLPG----IVFETIRWWDP-VTFAA----------------------------
AfiGPCATh    191  LAWALIVWRCSLVFSSVDKIVSVLIHLLPG----IVFETIRWWDP-ATFAA----------------------------
KflGPCATh    176  LAWALIVWRCSLVFSSIDKIVSVLIHLLPG----VVLEIIRWWDP-SNFSH----------------------------
EmuGPCATh    123  VYSAIILFRNSFVFENYDKMTSCFIHVLPP----LISHCVRWFPK-NSSNP----------------------------
OviGPCATh    105  AYSCAFLFRNALVLHDFQKLVSSFIHILPV----IFSVLIRWFPS-ETSTL----------------------------
SpuGPCATh    167  VTWSIVLFRNCLVPHSIERMTCLIIHLMPS----LITVLVRWYPT-ETSQH----------------------------
CgiGPCATh    177  LIWAMVVYRNSLVFHSTDKVTSAYIHILPA----LLSHGIRWYRE-EVSKY----------------------------
LgiGPCATh1   153  LLWAAVIFRNSLVHSVDKVTSVYIHTIPA----FLSHAIRWYSE-DTSMK----------------------------
LgiGPCATh2   179  LLWAMVIYRNSLVHSIDKVTSVYIHIIPA----FLSEVIRWYPE-ESSSK----------------------------
LcoGPCATh    221  VAWALVTWRNSLVFHSIDKITSVFIHLFPP----LVMMTIRWLPE-LECQSS------------------------NYRDT
MciGPCATh1   224  VAWALITWRNSLVFHSLDKVTSVFIHLFPP----LVMVCIRWMPE-LQRDIYC-------------DNTPFVTSYRNE
MciGPCATh2   219  VLWAIITWRNSLVFHSLDKVTSVFIHLFPA----LVTTTLRWFTV-LHGDPDQ--------------A------LVYRDQ
MveGPCATh    251  LATAIITWRNSLVFHSIDKVTSVYIHMSPP----TTLVTVRWLYP-DPE-H-------------------------A
UmaGPCATh    246  LAESVATWRNSLVFHSLEKMTSLFIHLYPP----FVFTTMVHFMP-HDEAV-------------------------S
LbiGPCATh    177  LASAVITWRNSLVFHDQDKVTSLFIHLYPP----FTFTVIRHEYP-NAE--------------------------A
SpoGPCATh    200  LAWSVVAWRNSLIFHSIDKITSLFIHFFPP----VVLHTTIVHLTN-KSYLK-----------------------D
SceGPCAT     201  LCEAVITWRNSLVIHSIDKTTSCFIHIIPP----CVMMVIYHGLP-LEYKI-----------------------E
LthGPCATh    196  LSEAVITWRNSLVIHSVDKITSCFIHIMPP----ITMMTIHHGLG-EDLKR------------------------A
PkuGPCATh    203  LSEAVITWKNKLVLHSLEKITSTFIHVLPS----VTMLVITHQLS-HEYKL------------------------E
NcrGPCATh    273  NATAIIMWRNSLVFHSIDKVTSLFIHIMPC----ATLHCIVHLLD-PAEQR------------------------K
CbaGPCATh    261  NAVAIVMWRNSLVFHSLDKVTSLFIHVMPP----VALHCIVHLTP-DDYLR------------------------E
AclGPCATh    261  NAVAIAMWRNSMVFHSMDKVVSLFIHVPP----VTLHCIVHLTP-SKVLR------------------------E
CglGPCATh    268  NAVAIVMWRNSLVFHSFDKVTSLFIHIMPC----ATLHCIVHLID-PAAQQ------------------------A
BbaGPCATh    265  NAVAIIMWRNSLVFHSFDKVTSLFIHIMPC----ATLHCIVHLYP-EDKLQ------------------------G
DdiGPCATh1   359  LAWGTIVWRNSLVFHDVDKITSVFIHICPP----IVTVCLRWEPN-VYPEQ----------------------------
DdiGPCATh2   192  LLGAVIPYRNSMVFHSLDKATSVIVHLEPS----LVTLSLRWNDE-FLFSK----------------------------
AsuGPCATh    192  LMWAIVAWRNSLVFHSIDKATSVLIHLIPA----IVTASVRWHILPATHPI----------------------------
EdiGPCATh    142  LLTAIPMWRNSLVFHDLDRLTSVYIHLFPC----LVIVCIRWYVL-TTVPQ----------------------------
AcaGPCATh1   189  LAWSVLAWRNSLVFHSLDKTTSLFIHLTPN----IILLAIRWLDE-DPDSLA----------------------------
AcaGPCATh2   222  LAGAIVMWKNSLVFHSLDKMISLFIHIYPP----IVTVCLRWHS-DSFVV----------------------------
PbrGPCATh    255  LAWAVPLWRNSLVFHDLDKLTSCAIHILPM----LLTEQLRWFPS-DSSLSICGD----------------------------
NgrGPCATh1   225  LAIAIVMWRNSLVFHSLEKVTSVFIHLFPA----LVTEAIRWLMF-NDNTQ----------------------------
NgrGPCATh2   179  ILLAIVFWRNSLVFHDFDKLTSAFIHTFPP----LLSEAIRWYPE--QFPE----------------------------
MbrGPCATh    202  LAIAIVAWRNSMVFHSLDKTTSVYIHVIPA----IVSESWRWDEL-TECHA----------------------------
BsaGPCATh    187  LAWAVLAFSQSLIFHSAPHMTSVFIHTSPM----LLTEAIRWLLP-DEHKA----------------------------
OtaGPCATh    168  VLLAIPLWRNSLVFHSVDKVQSVFVHANPC----LMTVCGRWYGF-GDDENRLSVA----------------------------
MpuGPCATh1   194  LLWAIPLWRNSLVFHSHDKVQSVFIHTAPA----IITVCARWYGQ-DASPLVAIGAWSERV--------------LGT
MpuGPCATh2   151  LAWAIPTFGNALVLHSPKHAVALIVHISPP----FVTWAMRWHAD-AHERA----------------------------
MspGPCATh1   179  ILWAIPLWRNSLVFHSHDKVQSVFIHTAPA----IITVCCTRWYGQ-GDLTWSWWGL-GDATGWLFAARE-----GDHGQA
MspGPCATh2   143  LGWAVPALANALILHSVEHTAALFIHLSPP----VVMVAMRWHAA-EHEAA----------------------------
CreGPCATh    139  ---KVGAGAGSAVRRAPHQVTSLFIHLVPA----LVSWSLRWYGDPARFGP----------------------------
CowGPCATh    479  LAWSVITWHNSFVFHDIDKMTSSAIHLFPA----IVTVSIRWYTP-LEGQA----------------------------
CmeGPCATh    177  VLWAMVAWRNALVFHSIDKMTSVFIHLFPP----LVTLNARWHSD-LIISRRI---------------G-----ICSHE-
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End of DUF2838|

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PpaGPCATh1  161 H--------------------AVDDT-G----PWPAWP--LLEN-DRQ-LWTWLFVVP-LIAYSVWQILYLLVVNV---
PpaGPCATh2  160 H--------------------AIDDT-G----PWPAYP--LLEN-NQQ-LWTWLFVVP-LIAYTLWQLLYLLVVNV---
SmoGPCATh1  183 H--------------------SLDAT-G----PWPAWP--LVHD-NRA-LWTWLFFVP-LIAYSVWQALYLLIVNV---
SmoGPCATh2  161 H--------------------STELT-G----PWPAWP--LVQT-RTD-LWTWLFAVP-LAAYTVWQLLYFLIVNV---
ZmaGPCATh1  189 M--------------------HPEGR-D----ARVTWP--YVED-KSY-MTWLFFVP-LAAYTLWQLMYFLIVNV---
ZmaGPCATh2  186 M--------------------HPEGR-D----ARVTWP--YVED-KSY-LWTWLFFVP-LAAYTLWQLMYFLIVNV---
OsaGPCATh   208 M--------------------HPEGR-A----ARVTWP--YVGD-KSY-LWTWLFAVP-LAAYTLWQLMYFLIVNV---
MacGPCATh1  200 M--------------------HPAGR-A----ARVSWP--YVED-KSY-LWTWLFVVP-LLAYTLWQILYFLIVDV---
StuGPCATh1  192 M--------------------HPEGT-P----ERASWP--YVES-QSY-LWTWLFWVP-LAAYFLWQVLYYLIVDV---
StuGPCATh2  186 M--------------------HPEGT-P----ERASWP--YVEN-QSY-LWKWLFFVP-LAAYFFWQVLYYLIVEV---
RcoGPCAT    204 M--------------------HPEGT-S----GRASWP--YVED-KSF-LFTWLFLVP-LVAYFLWQLLYFLIVNV---
AthGPCAT    201 M--------------------HPVGT-D----RRVSWP--YVED-KAY-LFTWLFLVP-LVVYTLWQKLYFLIVNV---
BvuGPCATh   256 M--------------------HPEGT-A----RRVSWP--YIED-TSY-LVTWLFLVP-LFAYTLWQVLYFLIVNV---
NnuGPCATh   198 M--------------------HSDGNAG----RRASWP--YVEN-KSY-LWTWLFVVP-LAAYTLWQYLFFLIVNV---
EguGPCATh   204 M--------------------HPEGR-A----ARVFWP--YVED-KSY-LWMWLFCVP-LVAYTLWQLLYFLIVNV---
NadGPCATh   216 I--------------------HLEQKGG----HRTAWP--HVAD-KTT-LWTWLFFVP-LVAYTLWQLLYFLIVNV---
AtrGPCATh   185 V--------------------DAGQQAG----VKAAWP--SVED-NAE-LWTWLFWVP-LVAYTLWQLLYFLIVEV---
LtuGPCATh   235 M--------------------HPEGKAS----DRASWP--YVED-KSY-LWTWLFVVP-LVAYTLWQLLYFLIVDV---
AfiGPCATh   237 M--------------------HPTGEAG----GRSSWP--YVED-KAY-LWKWLFCVP-LVAYTLWQLLYFVIVNV---
KflGPCATh   222 H--------------------SPDEF-GPWGHGHTPWP--VVED-TRK-VWTWLFTVP-LIVYSVWQALYWIIVEV---
EmuGPCATh   169 WWKGFVN------------T-------------GGSTNV-SVFN-PMD-DWIYLVVIP-NAFEITHTLLYFIIVHV---
OviGPCATh   151 WYTAFSD------------T-------------GAKPNI-YLWI-HDL-DWFYVMLIP-ITIETAREILYLIIYG---
SpuGPCATh   213 WYQDFAN------------T-------------T---RM--EMA-TGW-EELWLVAVP-LACYMCHLVLYLALFVW---
CgiGPCATh   223 WFDEF-----------------------------------V--PEM-LEL-SPIWLLVVP-FACELIHSGLYFLVIHI---
LgiGPCATh1  199 WRKDF-----------------------------------V--PDI-NNW-SVQWLIVVP-FLGEVLHSILHSIITSI---
LgiGPCATh2  225 WPCHF-----------------------------------I--PLL-SEW-SFIWLVAVP-AASEIGHNLIVTLITCI---
LcoGPCATh   273 RFPGVTN-------------------------------D-ITM-SEKEAMLIS-TIAYLIWQALYFVFIMV---
MciGPCATh1  284 RFPALDN-------------------------------L-ELP-SEKDVMIYS-TIAYGIWQSLYYFIMV---
MciGPCATh2  274 HFPAISK-------------------------------M-PVM-GWWYTLFVS-TGFYLAWQIFYVCFVMV---
MveGPCATh   297 RYPALKN-------------------------------M-EVL-PTAQSLTAA-IALYLTWQIAYYLLVVV---
UmaGPCATh   293 RFPALKN-------------------------------L-ITL-NGYTSFWFN-VTIYLIWQLVYYELIVI---
LbiGPCATh   222 RFPALRE-------------------------------L-EYL-HPLRALLLS-AGIYVVWQFLYWKFVLV---
SpoGPCATh   247 RFPAVLK-------------------------------V-KKI-DLLSSVELA-SFFYALWQIWYYFFIQV---
SceGPCAT    248 RFPGAII-------------------------------Q-SEL-DIKKNILWT-SLYYLIWQSLYHYFITI---
LthGPCATh   243 RFPAASL------------A----------G--------S-KKW-NLKYNIFWT-SLYYLLWQSAMYHYFITI---
PkuGPCATh   250 RFSGSVK-------------------------------L-QQW-DIMYGIIQT-SLLYLIWQLGYHYFITI---
NcrGPCATh   320 RFPSIWT------------I-----------KTSPP--GS-PTAYA-NVISMLAWS-TIPYAIWQIAYYFFITV---
CbaGPCATh   308 RFPAVHT------------I-----------KYSSK--GS-P-GHY-ELAAMLIWA-TIPYAIWQISYHFFISV---
AclGPCATh   308 RFPAIYD------------I-----------KFSKP--GS-P-NHY-SLLSMLWA-TVPYVIWQLTYHFFITV---
CglGPCATh   315 RFPAIWT------------I-----------KTSPA--GS-STAYA-NVFSMLAWS-TIPYAAWQLMYYFFITV---
BbaGPCATh   312 RFPAIWA------------I-----------KTAKP--GS-ATAYA-NIVSMLAWS-TIPYALWQLSYYFFITL---
DdiGPCATh1  405 LA--------------------------------CGGVE-CVL-SFKEIFFVP-FVVYAFWQVFYYIKTEV---
DdiGPCATh2  238 -Q---NQ----------------------------------I-EEP-NWKNFYLYP-LIAYSIWQLVYEFWVGK---
AsuGPCATh   239 -D---KE----------------------------------S-LTA-TWTETFWIP-MFFYLLWQTLYVYVML----
EdiGPCATh   188 ----------------------------------------L-TIMNGLIIP-SFLYILWQIIYLIITEG---
AcaGPCATh1  236 TYET-LR----------------------------------G-KDA-TETQMVFLP-IIPYLIWQVILYIKVQV---
AcaGPCATh2  268 CR----------------------------------D--AD-CSI-SWTASFWMP-LMLYSFWQALYIFKTEL---
PbrGPCATh   305 ----------------------------------EWP--S--C-GTV-ALKDIAVYP-LLPYVIWQIAYTIKTQSKFL
NgrGPCATh1  271 TPKIITP-------------I-----------GESYSICVNED-CYV-SLVDIYVPH-ICLEIFWQISYTIKTHF---
NgrGPCATh2  224 YS---------------------------------VCIREN-CEV-TWFEVIVPH-LLFELFWQISYFIKTEH---
MbrGPCATh   248 -NPE-LE----------------------------------M-CQL-SLMDWLVYP-IAFYAAWQVFYLWYTEV---
BsaGPCATh   233 NFTIASA------------E-------------AP----IYSDP-LNV-STFDLMWKSVVYFYGWWVVLYYVWVFV---
OtaGPCATh   219 ----------------------------------DLD--SDVT-VLQ-GSLDLMVYP-MIAYLIWQTLYLIKTEY---
MpuGPCATh1  253 RLPGLLG----GNA-NRLGVA-------------ELSTP--M-TS-TRE-MLTEFYLWP-TLGYIAWQVAYLIKTEL---
MpuGPCATh2  197 F-PGVFG-------------VPHANSG-D----AKRGTS--Y--A-ESV-TTMDLLVPA-ATLYFAWAGAHVIWLLI---
MspGPCATh1  248 VAPGLMYADVAAVHRAPNRLT-------------VEQLT--MSYD-VVD-VVREFYVYP-VVGYLIWQVIYLVITEL---
MspGPCATh2  189 F-PGILP------------MPL------------DAA--N--G-SGL-GYVELITPA-VTVYAVWWIVHVAWIVS---
CreGPCATh   183 PPEATEQ------------E------------RE----RW--H-RA--GGLSNVLLP-VASYVVWAVAYYIKLFV---
CowGPCATh   525 SVCSQDD----------------------------------C-SIP-SVWSWLSSP-LVIYAIWQLSYFIKTEY---
CmeGPCATh   231 -----AD----------------------------------C-IALGRRAFTVAVP-LVIELIWQTLYLAKILV---
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PpaGPCATh1 207  --LRHQRLLKDPEVM-TSF-RELSRKA------SR--A---NN---IWWRLSGILL-----------------G----D----
PpaGPCATh2 206  --LRKQRLLNDPEVM-TSFSRELSRKA------QR--S---NN---IWWRLSGVL------------------G----D----
SmoGPCATh1 229  --LRRQRLLRDPEVM-TSY-RELSRKA------AR--A---NN---IWWWLSGIL------------------G----D----
SmoGPCATh2 207  --LRRQRLLNDPEIM-TSY-RELSRKA------SR--A---NN---IWWRLSGIL------------------G----A----
ZmaGPCATh1 235  --LRRQRLLRDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
ZmaGPCATh2 232  --LRRQRLLRDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
OsaGPCATh  254  --LRRQRLLKDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
MacGPCATh1 246  --LRRQRLLQDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
StuGPCATh1 238  --LRRQRFLQDPEVM-TSY-RELSKKA------KK--A---NN---VWWRLSGIL------------------G----D----
StuGPCATh2 232  --LRRQRLLRDPEVM-TSY-RELSKKA------KK--A---NN---MWWRLSGIL------------------G----D----
RcoGPCAT   250  --LRRQRLLRDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
AthGPCAT   247  --LRRQRLLRDPEVM-TSY-RELSKKA------EK--A---NN---KLWQLSGIL------------------G----D----
BvuGPCATh  302  --LRRQRLLRDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
NnuGPCATh  245  --LRRQRLLRDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
EguGPCATh  250  --LRRQRLLRDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGIL------------------G----D----
NadGPCATh  263  --LRRQRLLRDPEVM-TSY-RELSKKA------KK--A---NN---VWWRLSGVL------------------G----D----
AtrGPCATh  232  --LRRQRLLRDPEVM-TSY-RELSKKA------QK--A---NN---IWWRLSGVL------------------G----D----
LtuGPCATh  282  --LRRQRLLRDPEVM-TSY-RELSKKA------KK--A---NN---IWWRLSGIL------------------G----D----
AfiGPCATh  284  --LRRQRLLRDPEVM-TSF-RELSKKA------QK--A---NN---VWWRLSGIL------------------G----D----
KflGPCATh  272  --LRKQRLLRDPQVI-TSF-RELSRKA------ER--A---NN---LFWWASGIL------------------G----D----
EmuGPCATh  216  --IIKP---N-EKYN-DNY-RYLRTKY------FS--K---VD---FFKR----I------------------P----K----
OviGPCATh  198  --CVKP---S-EKHL-DSY-RYMHKKK------LL--A---HL---IWNR----F------------------H----A----
SpuGPCATh  256  --ALGSTFSS-SEYL-NNY-TFLAYQS------------NN---VFSRAIRCK--------------------G----G----
CgiGPCATh  261  --VAKP---S-EEYV-TSF-NYLGKKQ------------DS--CLYKTFNVC--------------------G----E----
LgiGPCATh1 237  --FP-P---P-EEYL-TSY-KCLIAQE------SS--FMFRAVDIL--------------------------G----P----
LgiGPCATh2 263  --CK-P---P-EHYQ-TSY-RLLSKT-------ST--FIYRAINIC--------------------------G----P----
LcoGPCATh  310  --RRREKVES-GLRV-TSY-SWLLDDS------HG--R---KG---LIQKAAFVF-----------------G----A----
MciGPCATh1 321  --GRRDKVES-GLRL-TSY-SWLLDDT------HG--K---KG---FIQKMAFMF-----------------G----P----
MciGPCATh2 311  --AKRDKVES-GSRT-TSY-TTLLNKS------PENKN---KS---FILALTSLF-----------------G----E----
MveGPCATh  334  --RWREKVES-GKRV-TSY-TWLLNDP------K----SG---MIAKTAHTF-------------------G----E----
UmaGPCATh  330  --RKKSIET-GERI-NSY-STMSKGK-------G-----------PVANLLGKA------------------P----P----
LbiGPCATh  259  --DRRAKIQS-GQRT-TSY-SWLLNDK------Q--------G---MIGRSLAST-----------------P----P----
SpoGPCATh  284  --GRQKQIQE-G-RP-TSF-TWLSKAY------S---KT---KLGRAVAKL--------------------P----Q----
SceGPCAT   285  --KKSSKIKS-GERM-TSF-EYLITHQ------F-----KN--FW---AVKL------------------R----S----
LthGPCATh  282  --RKSSKIKS-GQRA-TSF-EYLITHQ------F-----KN--FW---AAKL------------------P----E----
PkuGPCATh  287  --RRADKIKK-G-KV-TSF-EYLRKSM------N-------TH---KFVRFINSL----------------P----E----
NcrGPCATh  366  --RRRDKIAA-G-RP-TSF-TWLRKSY------S-----KN---WLGKAILNL----------------P----D----
CbaGPCATh  353  --RRAEKIAA-G-RP-TSF-TWLRKSY------A-----KT---WIGKIVNSL----------------P----E----
AclGPCATh  353  --RRAEKIAA-G-RP-TSF-TWLRKSY------A-----KT---WIGKIVINL----------------P----E----
CglGPCATh  361  --RRREKIAA-G-RP-TSF-TWLRKSY------S-----KV---WIGKIVLGL----------------P----S----
BbaGPCATh  358  --LRREKIAA-G-RP-TSF-TWLRRSY------A-----RT---WIGKIVLSM----------------P----S----
DdiGPCATh1 441  --VDSDKIANDKEIM-TSS-RWMSVKQ------P-------H---PIYRWCQKN----------------G----Y----
DdiGPCATh2 271  --FKKDTIKE-NNYT-TSL-SFLSTIK------EG-EK---GS---LISRYLNFA---------------K----P----
AsuGPCATh  271  --LRQNTIRE-RNYI-TLL-NFLINQ-------S---NS---IVSRILNIL------------------P----T----
EdiGPCATh  215  --FKKETIKK-NHYI-TSL-IWLSQEH------P-------H---PVYLYLLKK---------------G----F----
AcaGPCATh1 272  --ISAKKVEE-QDYQ-TLF-RWFSSMD---------K--GG----IGKLIKKA---------------S----P----
AcaGPCATh2 302  --VDKKKLDSDANIM-TSL-RWFIRED------K------PH---PIYKALLVK---------------G----I----
PbrGPCATh  342  RLSKPVSVADDDLVQ-TSF-KWLLSAN------E-------GP---VFRLLQKF--------------PT----L----
NgrGPCATh1 319  --LDREYLQKQNNIQ-TSY-NYLIKSK------A-------F---IQTLSDKLY--------------G----K----
NgrGPCATh2 261  --LDRNILKERSHVI-TSF-RWITEMD------K------KS--KSYKLGQKF--------------S----A----
MbrGPCATh  283  --LNADHLRTDQALE-TSL-RWLARSP------GG--M---AAVAKTFCRAVGM--------------K----PDENF
BsaGPCATh  278  --IMGPRIKRR-GYK-TLF-DRVVSRG------P-------T----KFLA-KISK-------------N----D----
OtaGPCATh  255  --VDKAKLDTDPALM-TSL-RWLASDR------K-------SA---ANKFALKTMRGIGLFGTDEFFDPK----T----
MpuGPCATh1 306  --HDVKRLDEDPELV-TSL-RWLAGDY------K-------LA---VTRSTLRTCRRLGFFKVDELFDAS----S----
MpuGPCATh2 248  --FGRHKGAKKTAVYGTPR-AELVSDTVYHYTMRT--VKPFGD---VCGYEV-------------------ARPSK----
MspGPCATh1 307  --FYVKRLDNDPELV-TSL-RWLANDY------K-------AP---VTRWALRTSRRVGLFAQDELFDHN----S----
MspGPCATh2 232  --HGRYHG-HSNTSG-SSH-DTVFHMT------LR--G---NK---VLSRWVGYD-------------NDRPAD----
CreGPCATh  224  --FSRAKIQQR-GYR-TLF-NYVTSQK------K-------G---TFHALARRI------------------P----P----
CowGPCATh  562  --VDHAKIAANVRIK-TSY-RWLSSSR------G-------H----ISYRIMNKF----------------D----R----
CmeGPCATh  264  --ISRRKLDRNPELI-TSL-RWLTRHS------G-------S---AVSRVLNIF------------------G----E----
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PpaGPCATh1  246  ----N-NRVAMYAIIQAIFTVFTMALTI-PLFKHYKVHITEECLKVAASVWNGGIFFFDVLPRKMDAKKKR-------K
PpaGPCATh2  246  ----N-NRVLMYCIIQGIFTILTMGLTV-PLFKSYRLHTFQCLKVAASVWNGGIFFLDVMPRKIDAKKNK-------K
SmoGPCATh1  268  ----R-NRVVMYAALQAAFTVATMALTV-PMFKSYRLEVLFELFKAAVAVWNGGKWLFDVMPRQMEKKKTGKV--YS-KA
SmoGPCATh2  246  ----Q-NRLVMYAVIQALLTVATMALTV-LMFKSYRLHCAFELLKVAAALWNGGNFLFVMPRQADRKKAKAI--AK-LQ
ZmaGPCATh1  274  ----R-NRQVMYILLQALFTVATMALTV-PIFLSYRVHVVFIILKVCASTWNGGSFILEVMPRQVERKQQKKL--GM-KP
ZmaGPCATh2  271  ----R-NRQVMYILLQALFTVATMALTV-PIFLSYRVHVVFIILKVCASTWNGGSFILEVMPRQVVQKQLKKL--DM-KP
OsaGPCATh   293  ----R-NRPLMYILLQALFTVATMALTV-PIFLSFQMHVVFQILKVCASTWNGGSFILEVMPRQVVQKEKKKL--EM-KP
MacGPCATh1  285  ----K-NRQIMFILLQAVFTVATMALAV-PIFMSYKTHVTFQIFKVSAITWNGGSFILDVIPRQAVLREKKKL--EM-KP
StuGPCATh1  277  ----Q-NRLLMYILLQAVFTIATTALTV-PIFLSYKLHVYFQIFKVSASIWNGGNFMLDVMPRQVILKEEKKK--SKMST
StuGPCATh2  271  ----Q-NRLLMYILLQAVFTVATTALTV-PIFLSYKLHVMYQILKVSASVWNGGDFLLEVMPRQVILKEKKKS--ET-RD
RcoGPCAT    289  ----Q-NRMLMYILLQALFTVATTALTV-PIFLSYEHHAVFQILKVSAAVWNGGSFLLDVMPRQVILKEKKKS--EL-QP
AthGPCAT    286  ----Q-NRIWMYIIFQAIFTVATMALTV-PIFLSYRLHVVFQILKISAAVWNGGSFLLEVMPRQVIQKEKKKK-AEM-QP
BvuGPCATh   341  ----Q-NRLLMYIAFQAIFTVATMALTV-PIFLSYELSVVFQILKVSAAVWNGGSFVLEVMPRQVILKEKKKT--QM-QP
NnuGPCATh   284  ----Q-NRMLMYILLQAVFTVATMALTV-PIFLSYEMHVVFQTLKVSATWNGASFLLEVMPRQVILKEKRKL--EM-QP
EguGPCATh   289  ----Q-NRPTMYIIFQGIFTVATMALTV-PIFLSYEHHVLFQILKVSATWNGGSFLLEVMPRQVVLKEKKKL--EM-KP
NadGPCATh   302  ----Q-NRLLMYIVIQAIFTVATMALTV-PIFMVMEHHATFQILKVSAAVWNGGSFLLDVMPRQVVLDNKRL--EM-QP
AtrGPCATh   271  ----Q-NRALMYIVIQAFTVATTALTV-PIFKSYKHFTFQILKVSAAVWNGGSFLLEVMPRQVVLKEKKKL--EM-QP
LtuGPCATh   321  ----Q-NRLFMYILLQAAFTVATMALTV-PIFMSYKVHVVFQILKVSATWNGGSFLLEVMPRQVVLKEKKKL--EM-KP
AfiGPCATh   323  ----Q-NRNFMYMLLQGAFTVATMALTI-PIFLSYELHCLFQILKVSASVWNGGSFLLEVMPRQVVLKEKKKL--EM-KP
KflGPCATh   311  ----A-NRVVMYAIIQGLFTIATTALTI-PMFVNMRFHVAFQIFKIVTSVWNGGGYFFDVMPRQIVTKDEKRK--AL-KS
EmuGPCATh   247  ----I-VQTLIWVGLNIIVNFVLNMISL-LAWCTHLFHTTMIVAMVVVMSWYGASYYLYEAYLALRKAIENN-E-VPA-
OviGPCATh   229  ----R-WHLLIWIVFCILSSVVVICLAL-IAWCSYLFHSCLIIIQLLTISWNGACYYVDYPIEVQRRCPQPL-N-KLP-
SpuGPCATh   291  ----K-FRLLVYLIFQGIYASITLAMTW-LWENFWIAHIVFICFVFTIATYNGSTYYLDIFPKKAFESDPYRL-C-GKS-
CgiGPCATh   293  ----R-CRPLMFYVFNWLFCIVSLAGVF-IWYHFYTAFICIFLGVMSTVLIMNGGNYYIDVFSKR----------------
LgiGPCATh1  268  ----N-YRVVLYVVFNWIYCLVSVTLSI-IWYNCHLAFAAFTIAFIFFIITYNGATYYLDVFSVRKKSDE-----------
LgiGPCATh2  294  ----K-YRILLYLIFNWLFCLASFTMTI-LWYNYFIAHIVYLSLMFLVITNGARFYLDVFSVRPGISG-----------
LcoGPCATh   348  ----K-YKLYFMLIQLVYNVVTTMPIY-FLFQHFWLHTIFLITIFTASIHNGASFYIEVFSRRYALEVEKLV-E-RSK-
MciGPCATh1  359  ----K-WKSEMFMFIQLVYNIVTSIPIF-FLFQYTWLHTTFLIVMFAVSWNGANYYIEVFSRRYISEIESIK-E-EDE-
MciGPCATh2  351  ----K-YKLHMFIFWQFWYTLGTSALTY-FYYKSFWFHSSCLMTMFAVSWNGASYYIDVFSKHYLDEVERRL-A-EFK-
MveGPCATh   370  ----K-YSIPTFMGIQLLYTFVTCLFAL-ITYRYERLNTAFHVGLFLVSWNGACYYMEVFSKQYEKQLSKLA-E-EVS-
UmaGPCATh   364  ----K-RREPAFMLLQFVYTIITTPAPLLLYPNRTASAVFFAGIFVISWNGASYYVEVFGRRFEKELLQLR-S-ELE-
LbiGPCATh   294  ----A-YRELTFMGGQLIYAILTEIPALFVYRSSFWSAAFLIFIFAVSWNGGGFYIEVFGRKFERELEALR-R-ELA-
SpoGPCATh   319  ----N-LQPFVFMIIQYLYSITTMIPCS-LWYNNKLYSTAFLALIFGWSWNGASYYIDVFGRFQKELEALR-Q-QLA-
SceGPCAT    318  ----P-WPMIIYTLSQYFYQLFTMLLCG-IWIRYKLAAALFLTIVFLWASHNGATYYIDHYGKNFEKEVDRLR-L-EVE-
LthGPCATh   315  ----P-WPMFFYIIFQYCYQLGTMMLCG-IWFNYRGAAGAFLTFIYLCAAKNGATYYIDYYGKKFEKEVAKLK-S-EVE-
PkuGPCATh   322  ----P-LPLVAFTLIQYGYQLITMSLCP-LLYKHRHLCSAFVSFIFFYATYNGATYYIDYMGKKFQRQVSELQ-R-EIE-
NcrGPCATh   401  ----S-LQEPAFMLIQYTYAVLTMIPCP-LWFYYRWLSAVFLMGVFTWSVWNGSTYYIDVFGKRFQKELEAMK-A-EVA-
CbaGPCATh   388  ----S-LQEPAFMLIQYLYACLTIIPCP-IWEWYRWPSAFFLIFVFSWSVWNGANYYMDIFGKRFQKELEQMK-R-DVA-
AclGPCATh   388  ----A-LQAPAFMLIQYLYAVLTMIPCP-IWFYRWASGAFLTALFVVFAWSIHNGATYYIDIFGKRFQKELEEK-K-DVA-
CglGPCATh   396  ----A-LQEPAFMLIQYIYAVLTMIPCP-LWFFSRWASSLFLIVVFAWSVNGSTYYIDVFGKRFQKELEAMK-A-EVA-
BbaGPCATh   393  ----T-LQEPTFMMIQYVYAVLTMIPCP-LWFISRYASTLFLLVVFAWSIYNGSTYYIDVFGKRFQKELEAMK-T-EVV-
DdiGPCATh1  477  ----NVSPVVILILVQMLYTIATCISLP-FLIQSFWLHTVFMIYIFVTISWNGASYYFEVFSENYSSRLNSEF-K-HKH-
DdiGPCATh2  310  ----N-HRLFFFIFSQFTYTLLLTIIPCW-LYYKYQVIHSLYLIFVVTVCLWNGANFYIEYFSSNYVAQMKARE-E-RWT-
AsuGPCATh   307  ------KKVYIFMISQLLYTILTMIPCK-ILYNNMNIHLGYIVCMLLVCIWNGANYYIDFFSTHYVKQLKEKE-Q-RWK-
EdiGPCATh   250  ----KDRPLVILITVQFIYTIITIILPIF-IYYHYQYLELLWILFCVTWALSNGANFYEVFIKKYSKRVDESV-K-ELR-
AcaGPCATh1  307  ----N-RRLAAFVGYQLLYTIVTMIPSV-LFLRYFWAHTILIAGMCIILSAWNGANYYISTRYMESLERGT-E-RIA-
AcaGPCATh2  339  ----RIKPLVILVILQFTYTMLTLIPMH-FAYQNFYHESAVLFFVFCACTWYGATFYFEVFSESYSKRLSTRL-K-SGT-
PbrGPCATh   381  ----A-AKEAAFIVIQFLFTFVTMVPTI-LYFHSFAIHLIFLCLIITLAAWNGANFYVEVWTSRYKWANRAKL-E-AAA-
NgrGPCATh1  355  ----E-HRLLGFISLQFLFHMCTLIPIK-FMFDHFWVFAVLTSVFLVSWNGANFYFERFARVLHDLRKMA-E-KLE-
NgrGPCATh2  298  ----T-TRLFAFMAFQLFYHSLTVIPVI-FMFRYIYFFAFCLVAIYIVMVHNGSTFYFEKFVKMVAEQQKQAT-Q-QMA-
MbrGPCATh   329  DSESM-KTKLIFVACQFTFTIFTIIPCK-LYFDYHLVNVGFLFLFIYIACLYNGASYYLHVFSKRYVEQFRREI-E-TAA-
BsaGPCATh   312  ----L-IQKAAYMLTHFMFALFTMLLTT-VYWRSFWLHVAFVLVIISVSAWNNISGFYFTVFLAKYEEELRERA-G-LPS-
OtaGPCATh   306  ----W-KTKFVFVMFQLCYTIVTATFPIP-FCYLNYYAFTALMWVCFGTSVWNGAVYYIDIFSTRYVERLALAE-E-FIR-
MpuGPCATh1  357  ----I-KTKMVFVTIQLAYTVATFIPIP-LCYRYKTFELAYVGLTFLSCIWNGAQYYIDIESRRYIKRFEDGS-N-GAN-
MpuGPCATh2  297  ----A-SPILWYNAWHAGGCVGPMVILG-VWHHYYAHCALLLMTVASCAWHGAGQYAHAMLNQNERKIRALL--PD-DD
MspGPCATh1  358  ----L-KTKFVFVSLQLVYTMVTFLPIP-MCYASKAVHTTVMLLVFLSCIWNGAEYYIDIFSRRYAKKFDDGT-F-MGS-
MspGPCATh2  274  ----I-GPCVRYMVIHAAACLLVTLVAP-VFWYNFWAHTCFVLMLLASSIWNGSRRYYGMMTSSYERRLKALL--PE-HA
CreGPCATh   259  ----P-LQPPVYLFLHLCFCMTTFLVAL-GCWYSFWAHTALLAAVASASIWHGGSYYFEVFARKYHEHLMPKA-A-AEP-
CowGPCATh   598  ----R-FWPTVYMGIQLLFTVLTIIPTI-LFFQSFVVHTIFLGLLAALWNGANYYVTFLFERTRAQHAPPP-A--PI-
CmeGPCATh   300  ----R-YQNLALAFWQLIFTGVTCLPLA-IFWRYKWLHEIVLAFVGLIVVWNGSNYYFTVFASRYTRRMLEYARD-RVQ-
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PpaGPCAATh1  312 ------------------------------------------------------------------------
PpaGPCAATh2  312 ------------------------------------------------------------------------
SmoGPCAATh1  339 K-TESSPENPSKNVISIQ------------------EESSGG--TAPRGLLSTNC----------NGSVSSVSS--E-
SmoGPCAATh2  317 ------------------------------------------------------------------------
ZmaGPCAATh1  345 I-EQGSWTQGAPAD-GTY------------------IG----------------------------------
ZmaGPCAATh2  342 M-EQGSSTQGAPGG-DGG------------------TLGNHH-----------------------QHT-SEE----
OsaGPCAATh   364 M-EEANSSQNAEES-QGD------------------LSANG-----------------------QHS-SEH----
MacGPCAATh1  356 I-VEEPDRLSADLS-TSS------------------HATSG-----------------------EPS-G-----
StuGPCAATh1  349 V-PDQNDEISLQES-ATE------------------TNNTSE----------------------TVH-S------
StuGPCAATh2  342 V-TEQQHENPLQEN-SMK------------------TP----------------------------------
RcoGPCAT     360 A-HIQQYHSEPKQD-QSP------------------NSMEIR---------------------MKT-IHS----
AthGPCAT     358 I-EEQILHHEAVSH-PTE------------------NEPKST----------------------E---------
BvuGPCAATh   412 L-EAQPQLDSSSPL-DSP------------------VSAQYI--------------------QQS-------
NnuGPCAATh   355 L-PIQPNQTVATVE-PSE------------------DAKEPV----------------------K-IDH----
EguGPCAATh   360 I-LEQPRQPVVDLS-TNH------------------QHTSDT---------------------PDE--------
NadGPCAATh   373 I-LSCESTQAQKEV-AVP------------------DGLEK----------------------SGDTNNA--QK
AtrGPCAATh   342 I-TIPIDQPVESVP-MNM------------------EKNECN---------------------SLDPPDA--EP
LtuGPCAATh   392 I-PMQQQLDLSLAT-DTL------------------THSD-----------------------------------
AfiGPCAATh   394 I-PTADQPVFDSHA-END------------------YTSVGD--------------------YPSRVDG----
KflGPCAATh   382 K-QGDAAKDTISQP-NSP------------------GEVCQK--------------------CGS-LHSSASK
EmuGPCAATh   318 P-VNSKSPTEMEDENDED------------------EE------------VD----------E-----------
OviGPCAATh   300 LEVLNPEDHELLKNIDEG------------------KN-------------PG----------G--MCE-------
SpuGPCAATh   362 PE----------------------------------------------------------------------
 CgiGPCAATh      ------------------------------------------------------------------------
LgiGPCAATh1      ------------------------------------------------------------------------
LgiGPCAATh2      ------------------------------------------------------------------------
LcoGPCAATh   419 S-GKQDMDKSKT------------------------------------------------------------
MciGPCAATh1  430 K-LKA-----------------------------------------------------------------
MciGPCAATh2  422 E-KNQQNSKILT-------------------KQRSLR------R-------KQ----------QKHLDD-------
MveGPCAATh   441 S-AVAANQLAHDADEDKR-----------------H-------------EE----------EELHKQ-------
UmaGPCAATh   436 L-IRTAEKVVADAGKKHK-----------------SG------------ME----------QEGHVE-------
LbiGPCAATh   366 E-STARSSGSSTPTTICS-----------------GP------------SE----------TDLTAM-------
SpoGPCAATh   390 E-TPTNSGSSSALSR------------------------------------------------------------
SceGPCAT     389 N-LQQKLQPDSDAVISDA-----------------SV------------ND----------KDYLNV-------
LthGPCAATh   386 D-LQQQLSQKANSSSNNY-----------------SG------------VL-----------------------
PkuGPCAATh   393 A-MQQDIEERDKSGLSKV-----------------AT------------GI----------E-----------
NcrGPCAATh   472 K-WQHSPDGMVHSPTLTP-----------------HA------------GA----------QEEENK-------
CbaGPCAATh   459 K-WQNSPGAMFSPPNGPV-----------------DS------------DV----------N-LNTA-------
AclGPCAATh   459 K-WQASPAGTTSPTLLDS-----------------EN------------AS----------AAGARI-------
CglGPCAATh   467 K-WQHSPDVWPHEDGSGT-----------------AV------------VS----------PVASPA-------
BbaGPCAATh   464 K-WQTSPELMLTSPLMQP-----------------QT------------ES----------VVIDPQ-------
DdiGPCAATh1  549 N-KDQPLKITSIK--AFL-----------------KF------------LA----------L-FLTS-------
DdiGPCAATh2  381 K-IIMSSIGNTTSFNSNCDSPIMEYSKQQQQSNTLNSTHHKKEKPK-------DHYQQLTPPNLKHQKGHET-------
AsuGPCAATh   377 K-TIVSSFGAGDMSPMMQ-----------------SSTNQST---------------------------------
EdiGPCAATh   322 R-SESNTSIQTPKILDER-----------------ST------------SP----------N-ALSE-------
AcaGPCAATh1  378 R-LRRGSLALQQAINIGD-----------------DAEKSQ--------------------------------
AcaGPCAATh2  411 S-EAKEKAKEKEKAKKGL-----------------PT------------KN----------S-FLSF-------
PbrGPCAATh   452 R-ELSAVSQPDVYHGS--------------------------------------------------------
NgrGPCAATh1  426 M-ENKEQTSAITQ-----------------------------------------------------------
NgrGPCAATh2  369 H-PPQTNQK---Q-----------------------------------------------------------
MbrGPCAATh   404 V-AQEAKIEAIAELA---------------------EEQAS-KDAQ-E-------------------QR-----------
BsaGPCAATh   383 S-QGADGTTPLLS--SPR-----------------GA------------KK----------D-----------
OtaGPCAATh   377 C-QMVNELTESELETMQT-----------------MD------------FT----------DSEIE-------
MpuGPCAATh1  428 L-RHEDQQDGIIVTEVTG-----------------RK------------NT----------PPEGD-------
MpuGPCAATh2  368 --EDGGKKK--------------------------K----------------------------------
MspGPCAATh1  429 V-RDDDNADAAVAEAVLA-----------------AG------------SG----------DLARR-------
MspGPCAATh2  345 --RDNAPSEAPKKH-EH------------------VE------------------------------------
CreGPCAATh   330 A-PAHVSASATKK--D--------------------------------------------------------
CowGPCAATh   668 V-PSVVSPPA--D--V-------------------A-------------GK----------E-----------
CmeGPCAATh   372 K-IETNASSNPE-------------------KSSM------------------------------------
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PpaGPCATh1         --------------------------------------------------------------------------
PpaGPCATh2         --------------------------------------------------------------------------
SmoGPCATh1   383   E----------------KKA--------------------------------ICS--LCQQL-SSRKFE---LQK--
SmoGPCATh2         --------------------------------------------------------------------------
ZmaGPCATh1         --------------------------------------------------------------------------
ZmaGPCATh2   370   --------------------------------------------------------------------------
OsaGPCATh    391   --------------------------------------------------------------------------
MacGPCATh1   381   --------------------------------------------------------------------------
StuGPCATh1   375   --------------------------------------------------------------------------
StuGPCATh2   360   --------------------------------------------------------------------------
RcoGPCAT     388   --------------------------------------------------------------------------
AthGPCAT     381   --------------------------------------------------------------------------
BvuGPCATh          --------------------------------------------------------------------------
NnuGPCATh    381   --------------------------------------------------------------------------
EguGPCATh    385   --------------------------------------------------------------------------
NadGPCATh    403   A-------------------------------------------------------------------------
AtrGPCATh    373   L-------------------------------------------------------------------------
LtuGPCATh    412   --------------------------------------------------------------------------
AfiGPCATh    423   Q-------------------N-----------------------------GHP--VVDAN-ESKLVA---DAN--
KflGPCATh    414   DSLNGSLSGSGELET---NGDG----------------------------LKG--QMDAE--------------
EmuGPCATh    340   --------------------------------------------------------------------------
OviGPCATh    326   -------------S---DADVPCRLV--------------------SCESAHKIT--ELT---CH---------SAH
SpuGPCATh          --------------------------------------------------------------------------
CgiGPCATh          --------------------------------------------------------------------------
LgiGPCATh1         --------------------------------------------------------------------------
LgiGPCATh2         --------------------------------------------------------------------------
LcoGPCATh    430   --------------------------------------------------------------------------
MciGPCATh1   434   --------------------------------------------------------------------------
MciGPCATh2   448   -------------K------------------------------------------------------------
MveGPCATh    467   -------------G---REQ----------------E-----------------------------------EE--
UmaGPCATh    463   -------------E---DRD----------------EDKE-----------------QQAAA---AAA---AAAS--
LbiGPCATh    393   -------------V---SAS----------------KQPG------------PAS--DISE---------DSPT--
SpoGPCATh          --------------------------------------------------------------------------
SceGPCAT     416   -------------N---RDE----------------DFDD------------------------------------SS--
LthGPCATh    407   --------------------------------------------------------------------------
PkuGPCATh    415   --------------------------------------------------------------------------
NcrGPCATh    499   -------------R---LGE------P--TKNNNNSDSNDSSGSSTSSL----DNIP--LLTEEKSELPASATATATG-
CbaGPCATh    485   -------------K---D-----------------DSSKGHDKRQSI----DKIP--LLDETGQPQQN---------
AclGPCATh    486   -------------L---DDS----------------TSAHKECDKASL----DQIP--PLDAHAATTGS--------
CglGPCATh    494   -------------A---GAS-----TTGSLADGISGKRLDDDMRGVSGV----DNIP--LLNDERPAAVL---ATGAD-
BbaGPCATh    491   -------------P---KKA------SGTPSFEPSAQTARDAMARTTSL----DRIP--LLDDYTTANST---------
DdiGPCATh1   573   --------------------------------------------------------LIV---------------
DdiGPCATh2   445   -------------QFDSDTS-------------------------YI----G--------------------HE--
AsuGPCATh    401   --------------TSDNA------------------------I----G-------------------------
EdiGPCATh    348   -------------T------------------------------------------------------------
AcaGPCATh1         --------------------------------------------------------------------------
AcaGPCATh2   437   -------------C---S-F----------------------------FVPALTI----------------
PbrGPCATh          --------------------------------------------------------------------------
NgrGPCATh1         --------------------------------------------------------------------------
NgrGPCATh2         --------------------------------------------------------------------------
MbrGPCATh    430   --------------APEQD-----------------------V----Q--------------------------
BsaGPCATh    403   --------------------------------------------------------------------------
OtaGPCATh    403   --------------------------------------------------------------------------
MpuGPCATh1   454   --------------------------------------------------------------------------
MpuGPCATh2         --------------------------------------------------------------------------
MspGPCATh1   455   -------------S---G--------------------------------------------------------
MspGPCATh2         --------------------------------------------------------------------------
CreGPCATh    343   --------------------------------------------------------------------------
CowGPCATh    683   --------------------------------------------------------------------------
CmeGPCATh          --------------------------------------------------------------------------
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PpaGPCATh1          -----------------------------------------------------------------------------
PpaGPCATh2          -----------------------------------------------------------------------------
SmoGPCATh1    404   ------A-------------V-EEA-----TSSVRDLG------------LEPALFSRIK----------------
SmoGPCATh2          -----------------------------------------------------------------------------
ZmaGPCATh1          -----------------------------------------------------------------------------
ZmaGPCATh2    370   -----------------------------------------------------------------------------
OsaGPCATh     391   -----------------------------------------------------------------------------
MacGPCATh1    381   -----------------------------------------------------------------------------
StuGPCATh1    375   -----------------------------------------------------------------------------
StuGPCATh2    360   -----------------------------------------------------------------------------
RcoGPCAT      388   -----------------------------------------------------------------------------
AthGPCAT      381   -----------------------------------------------------------------------------
BvuGPCATh           -----------------------------------------------------------------------------
NnuGPCATh     381   -----------------------------------------------------------------------------
EguGPCATh     385   -----------------------------------------------------------------------------
NadGPCATh     404   --------------------E----------------------------------------------------
AtrGPCATh     374   --------------------C----------------------------------------------------
LtuGPCATh     412   -----------------------------------------------------------------------------
AfiGPCATh     442   ------Q-------------V-D------------------------------LLS------------------
KflGPCATh     441   ----------------------------------------------------M-KLRLGNGKSEEEAKGEKVLGKNGV
EmuGPCATh     340   SLRHN----LE-------TAL-EED-----RDS--D------------------I---------------------
OviGPCATh     353   SVDSSTNVMLE----YDSMAS-KER-----NGD--N------------------I---------------------
SpuGPCATh           -----------------------------------------------------------------------------
CgiGPCATh           -----------------------------------------------------------------------------
LgiGPCATh1          -----------------------------------------------------------------------------
LgiGPCATh2          -----------------------------------------------------------------------------
LcoGPCATh     430   -----------------------------------------------------------------------------
MciGPCATh1    434   -----------------------------------------------------------------------------
MciGPCATh2    449   -----------------------------------------------------------------------------
MveGPCATh     474   ------GV----------VV-EDK---K--NI-----------------------------------------
UmaGPCATh     483   ------GL--P--Q-----AG-ENK---K--DQ---------------------------------------
LbiGPCATh     412   ------SL--DPTL-----NL-DFK---K--DS---------------------------------------
SpoGPCATh           -----------------------------------------------------------------------------
SceGPCAT      426   -------------------SV-SS-------KS--D-------------------------------------
LthGPCATh     407   ---------------------------------E---------------------------------------
PkuGPCATh     415   ---------------------------------S---------------------------------------
NcrGPCATh     547   -----AEV--D--GGAKD-VA-RAR---R-PGA--E-LFG--AG-------AAPS------------------
CbaGPCATh     514   ------GN--A--NGGPN-SEANAR---A-TGA--E-ILYEAKGNVLDRKNVSAPL----------------
AclGPCATh     517   ------DK--A--NITTD-TM-RER---R--------------------------------------------
CglGPCATh     542   -----MDM--D--GGARD-VA-RER---RMGSG--E-S---------------R-------------------
BbaGPCATh     533   ------GF--D--GGARD-VA-RER---K--ST---------------------E------------------
DdiGPCATh1    576   -YLK-----------LIL--------------------------------------------------------
DdiGPCATh2    457   ------DL--A--PDTDD-VH-HHYNYS---S-------------------KPN-------------------
AsuGPCATh     408   ----------------------EVG---S------------------SPQ---------------------
EdiGPCATh     349   ------------------------SDA--E-------------------------------------------
AcaGPCATh1          -----------------------------------------------------------------------------
AcaGPCATh2    447   -LYF-----------LIERAL-AFA-----T-----------------------------------------
PbrGPCATh           -----------------------------------------------------------------------------
NgrGPCATh1          -----------------------------------------------------------------------------
NgrGPCATh2          -----------------------------------------------------------------------------
MbrGPCATh     437   ----------------------ELNE--ST--E----------------DPF-------------------
BsaGPCATh     403   ----------------------------------Q-------------------------------------
OtaGPCATh     403   ---------------------------------------------QILMTPV-------------------
MpuGPCATh1    454   ---------------------------------------------GRR-----------------------
MpuGPCATh2          -----------------------------------------------------------------------------
MspGPCATh1    457   -------------GGD-LA-RRS-----GGG--D-L---------ARRSGGPQ------------------
MspGPCATh2          -----------------------------------------------------------------------------
CreGPCATh     343   ---------------------------------A---------------------------------------
CowGPCATh     683   ---------------------------------Q---------------------------------------
CmeGPCATh           -----------------------------------------------------------------------------
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PpaGPCATh1       ------------------------------------
PpaGPCATh2       ------------------------------------
SmoGPCATh1  427  -------------------PT-----D-----AI-SCAS
SmoGPCATh2       ------------------------------------
ZmaGPCATh1       ------------------------------------
ZmaGPCATh2  370  -------------------HI-----Q-----E------
OsaGPCATh   391  ----------------------------------S------
MacGPCATh1  381  ----------------------------------M-----
StuGPCATh1  375  ----------------------------------E-----
StuGPCATh2  360  ----------------------------------Q-----
RcoGPCAT    388  -------------------AE-----E------Q-----
AthGPCAT    381  ----------------------------------T-----
BvuGPCATh        ------------------------------------
NnuGPCATh   381  ----------------------------------F-----
EguGPCATh   385  -------------------QN-----N------S----
NadGPCATh   405  -------------------VN-----N------S----
AtrGPCATh   375  -------------------RT-----N-----SL-----
LtuGPCATh   412  ----------------------------------Y-----
AfiGPCATh   448  -------------------SG-----D------E-----
KflGPCATh   466  ENGNGLHQRSIARANSCGTESGDKVSVEMNGKGSSLGLAR
EmuGPCATh   358  -----------------------EV-------------
OviGPCATh   378  -----------------------AV-------------
SpuGPCATh        ------------------------------------
CgiGPCATh        ------------------------------------
LgiGPCATh1       ------------------------------------
LgiGPCATh2       ------------------------------------
LcoGPCATh   430  -----------------------A-------------
MciGPCATh1  434  -----------------------K-------------
MciGPCATh2  449  -----------------------LN------------
MveGPCATh        ------------------------------------
UmaGPCATh        ------------------------------------
LbiGPCATh        ------------------------------------
SpoGPCATh        ------------------------------------
SceGPCAT         ------------------------------------
LthGPCATh        ------------------------------------
PkuGPCATh        ------------------------------------
NcrGPCATh        ------------------------------------
CbaGPCATh   552  ------------------------TGA-----------TM
AclGPCATh        ------------------------------------
CglGPCATh        ------------------------------------
BbaGPCATh        ------------------------------------
DdiGPCATh1       ------------------------------------
DdiGPCATh2  477  ------------------------Q------------
AsuGPCATh   415  -----------------------LLSV------------
EdiGPCATh        ------------------------------------
AcaGPCATh1       ------------------------------------
AcaGPCATh2       ------------------------------------
PbrGPCATh        ------------------------------------
NgrGPCATh1       ------------------------------------
NgrGPCATh2       ------------------------------------
MbrGPCATh   447  ---------------------KL-N------------
BsaGPCATh        ------------------------------------
OtaGPCATh   410  ------------------------------------D-
MpuGPCATh1  457  ------------------------E------------T-
MpuGPCATh2       ------------------------------------
MspGPCATh1  478  ----------------------KSL----------R-
MspGPCATh2       ------------------------------------
CreGPCATh        ------------------------------------
CowGPCATh        ------------------------------------
CmeGPCATh        ------------------------------------
```

Appendix S1. **Sequence alignment analysis of GPCATs.**
The protein sequences of GPCATs were aligned using the T-Coffee PSI/TM-Coffee web-service (http://tcoffee.crg.cat/apps/tcoffee/do:tmcoffee) and BoxShade (http://www.ch.embnet.org) was used for shading background according to conservation. Sequence numbering is according to the full-length protein sequences. See Fig. 3 for species abbreviations. The proteins for which catalytic GPCAT activity was determined (Fig. 7) have names highlighted in green. Sequence IDs: AcaGPCATh1, XP_004338657.1; AcaGPCATh2, XP_004368210.1; AclGPCATh, XP_001270843.1; AfiGPCATh, b3_c2279; AsuGPCATh, XP_012748160.1; AthGPCAT, NP_198396.1; AtrGPCATh, XP_011622896.1; BbaGPCATh, KGQ05851.1; BsaGPCATh, CUE73576.1; BvuGPCATh, XP_010666443.1;

CbaGPCATh, KIW96763.1; CgiGPCATh, EKC38105.1; CglGPCATh, XP_001229114.1; CmeGPCATh, XP_005537575.1; CowGPCATh, XP_004348404.1; CreGPCATh, XP_001693172.1; DdiGPCATh1, XP_636790.1; DdiGPCATh2, XP_643621.1; EdiGPCATh, XP_001738020.1; EguGPCATh, XP_010936661.1; EmuGPCATh, CDS42477.1; KflGPCATh, kfl00299_0090; LbiGPCATh, XP_001876784.1; LcoGPCATh, CDH53915.1; LgiGPCATh1, ESO91084.1; LgiGPCATh2, XP_009058350.1; LthGPCATh, XP_002553792.1; LtuGPCATh, b4_c3038; MacGPCATh, XP_009407293.1; MbrGPCATh, XP_001747618.1; MciGPCATh1, EPB88260.1; MciGPCATh2, EPB92530.1; MpuGPCATh1, XP_003062419.1; MpuGPCATh2, XP_003058481.1; MspGPCATh1, XP_002501336.1; MspGPCATh2, XP_002508227.1; MveGPCATh, KFH63290.1; NadGPCATh, b3_c6890; NcrGPCATh, XP_011394510.1; NgrGPCATh1, XP_002675713.1; NgrGPCATh2, XP_002673223.1; NnuGPCATh, XP_010273972.1; OsaGPCATh, EAY74703.1; OtaGPCATh, XP_003078006.1; OviGPCATh, XP_009166064.1; PbrGPCATh, CEO94537.1; PkuGPCATh, KGK40379.1; PpaGPCATh1, XP_001771632.1; PpaGPCATh2, XP_001756364.1; RcoGPCAT, XP_002514086.1; SceGPCAT, NP_011665.1; SmoGPCATh1, XP_002985957.1; SmoGPCATh2, XP_002979497.1; SpoGPCATh, NP_596320.2; SpuGPCATh, XP_003729899.1; StuGPCATh1, XP_006342345.1; StuGPCATh2, XP_006338125.1; UmaGPCATh, XP_011391556.1; ZmaGPCATh1, XP_008656604.1; ZmaGPCATh2, NP_001130177.1