**Supplementary Materials - Poxviruses capture host genes by LINE-1 retrotransposition**

Table S1. Accession numbers for sequences used in phylogenetic analysis shown in Figure 1B

|  |  |  |
| --- | --- | --- |
| **Organism** | **protein** | **Accession number** |
| Cowpox strain Ger14Cat1 | vGAAP/TMBIM4 | SNB58186.1 |
| Cowpox strain Ger10Rac | vGAAP/TMBIM4 | SNB48400.1 |
| Cowpox strain Ger02MKY | vGAAP/TMBIM4 | ADZ30397.1 |
| Cowpox strain Ratpox09 | vGAAP/TMBIM4 | CRL86727.1 |
| Cowpox strain Ger17vFME | vGAAP/TMBIM4 | SPN68348.1 |
| Vaccinia strain EvansCDS | vGAAP/TMBIM4 | AAV98625.1 |
| Cowpox strain Finland\_2000\_MAN | vGAAP/TMBIM4 | ADZ29327.1 |
| Cowpox strain Kost15Hs | vGAAP/TMBIM4 | AQQ13071.1 |
| Vaccinia strain Lister | vGAAP/TMBIM4 | Q49P94.1  |
| Cowpox strain Aus99cat | vGAAP/TMBIM4 | ADZ24213.1 |
| Vaccinia strain USSR\_CDS | vGAAP/TMBIM4 | AAW21699.1 |
| Camelpox strain CMS | vGAAP/TMBIM4 | AAG37461.1 |
| Camelpox strain Negev16 | vGAAP/TMBIM4 | QCW07309.1 |
| Camelpox strain M96\_Kazakstan | vGAAP/TMBIM4 | NP\_570396.1 |
| Cowpox strain GRI-90 | vGAAP/TMBIM4 | CAD90752.1 |
| Cowpox strain FM2292 | vGAAP/TMBIM4 | CRL87022.1 |
| Cowpox strain Ger07Vole | vGAAP/TMBIM4 | SNB49536.1 |
| Cowpox strain Ger91-3 | vGAAP/TMBIM4 | ABD97561.1 |
| Monkeypox strain USA03\_044 | vGAAP/TMBIM4 | AAY96807.1 |
| Monkeypox strain Cote d'Ivoire 1971 | vGAAP/TMBIM4 | AKG51345.1 |
| Monkeypox strain DRC\_07 | vGAAP/TMBIM4 | AGR36454.1 |
| Monkeypox strain Zaire96 | vGAAP/TMBIM4 | NP\_536611.1 |
| Monkeypox strain Congo03 | vGAAP/TMBIM4 | AAY97191.1 |
| Scale Drop Disease Iridovirus | TMBIM4 | YP\_009163856.1 |
| Harpseal herpes virus | TMBIM4 | AJG42933.1  |
| Homo sapiens | TMBIM4 | NP\_057140.2 |
| Mus musculus | TMBIM4 | NP\_080893.1 |
| Rattus Norvigicus | TMBIM4 | NP\_954547.1 |
| Bos taurus | TMBIM4 | NP\_001014914.1 |
| Ovis aries | TMBIM4 | XP\_014950252.2 |
| Grizzly bear | TMBIM4 | XP\_026355879.1 |
| CA Sea lion | TMBIM4 | XP\_027451274.1 |
| Stellar sea lion | TMBIM4 | XP\_027966737.1 |
| Weddell seal | TMBIM4 | XP\_006731256.1 |
| Northern fur seal | TMBIM4 | XP\_025738732.1 |
| Ghost shark | TMBIM4 | NP\_001279731.1 |
| Bettafish | TMBIM4 | XP\_029017613.1 |
| Yellow perch | TMBIM4 | XP\_028426613.1 |
| Gilt head Bream | TMBIM4 | XP\_030296356.1 |
| Homo sapiens | TMBIM3 | NP\_000828.1 |
| Mus musculus | TMBIM3 | NP\_075657.1 |
| Rattus Norvigicus | TMBIM3 | NP\_695220.4 |
| Bos taurus | TMBIM3 | NP\_001032682.1 |
| Ovis aries | TMBIM3 | NP\_001265493.1 |
| Grizzly bear | TMBIM3 | XP\_026344576.1 |
| CA Sea lion | TMBIM3 | XP\_027465497.1 |
| Weddell seal | TMBIM3 | XP\_006745469.1 |
| Northern fur seal | TMBIM3 | XP025727080.1 |
| Whale shark | TMBIM3 | XP020385145.1 |
| Bettafish | TMBIM3 | XP\_029023514.1 |
| Yellow perch | TMBIM3 | XP\_028453020.1 |
| Gilt head Bream | TMBIM3 | XP\_030268118.8 |
| Homo sapiens | TMBIM2 | NP\_036438.2 |
| Mus musculus | TMBIM2 | NP\_082500.2 |
| Rattus Norvigicus | TMBIM2 | NP\_653357.1 |
| Bos taurus | TMBIM2 | NP\_001068886.1 |
| Ovis aries | TMBIM2 | XP\_0040066421.1 |
| Grizzly bear | TMBIM2 | XP\_026357704.1 |
| CA Sea lion | TMBIM2 | XP\_027450780.1 |
| Weddell seal | TMBIM2 | XP\_006729299.1 |
| Northern fur seal | TMBIM2 | XP\_025739188.1 |
| Whale shark | TMBIM2 | XP\_020373190.1 |
| Bettafish | TMBIM2 | XP\_029006890.1 |
| Yellow perch | TMBIM2 | XP\_028437735.1 |
| Atlantic sea bass | TMBIM2 | XP\_018521446.1 |
| Gilt head bream | TMBIM2 | XP\_030278166.1 |
| Danio rerio | TMBIM2 | XP\_005163554.1 |
| Homo sapiens | TMBIM1 | NP\_001308356.1 |
| Mus musculus | TMBIM1 | NP\_081430.3 |
| Rattus Norvigicus | TMBIM1 | NP\_001007714.1 |
| Bos taurus | TMBIM1 | NP\_991367.1 |
| Ovis aries | TMBIM1 | XP\_004004971.1 |
| CA Sea lion | TMBIM1 | XP\_027443873.1 |
| Weddell seal | TMBIM1 | XP\_006750605.1 |
| Northern fur seal | TMBIM1 | XP\_025747486.1 |
| Ghost shark | TMBIM1 | XP\_007882730.1 |
| Bettafish | TMBIM1 | XP\_028986890.1 |
| Yellow perch | TMBIM1 | XP\_028448525.1 |
| Atlantic sea bass | TMBIM1 | XP\_018532965 |
| Gilt head bream | TMBIM1 | XP\_030257449.1 |
| Danio rerio | TMBIM1 | NP\_001005992.2 |
| Homo sapiens | TMBIM5 | NP\_055209.2 |
| Mus musculus | TMBIM5 | NP\_001186051.1 |
| Rattus Norvigicus | TMBIM5 | NP\_001005908.1 |
| Bos taurus | TMBIM5 | NP\_001029224.1 |
| Ovis aries | TMBIM5 | XP\_004021578.1 |
| Grizzly bear | TMBIM5 | XP\_026360365.1 |
| CA Sea lion | TMBIM5 | XP\_027452399.1 |
| Monk seal | TMBIM5 | XP\_021555821.1 |
| Northern fur seal | TMBIM5 | XP\_025736444.1 |
| Ghost shark | TMBIM5 | AFK11640.1 |
| Bettafish | TMBIM5 | XP\_028990283.1 |
| Yellow perch | TMBIM5 | XP\_028423643.1 |
| Atlantic sea bass | TMBIM5 | XP\_18554801.1 |
| Danio rerio | TMBIM5 | NP\_956885.1 |
| Homo sapiens | TMBIM6 | NP\_003208.2 |
| Mus musculus | TMBIM6 | NP\_001164505.1 |
| Rattus Norvigicus | TMBIM6 | NP\_062254.2 |
| Bos taurus | TMBIM6 | NP\_001069882.1 |
| Ovis aries | TMBIM6 | XP\_004006423.2 |
| Grizzly bear | TMBIM6 | XP\_026357713.1 |
| CA Sea lion | TMBIM6 | XP\_027449007.1 |
| Weddell seal | TMBIM6 | XP\_006729302.1 |
| Northern fur seal | TMBIM6 | XP\_025738444.1 |
| Ghost shark | TMBIM6 | XP\_007910207.1 |
| Bettafish | TMBIM6 | XP\_029013526.1 |
| Yellow perch | TMBIM6 | XP\_028439299.1 |
| Atlantic sea bass | TMBIM6 | XP\_018531358.1 |
| Gilt head bream | TMBIM6 | XP\_030277962.1 |

Phylip alignment for sequences used in phylogenetic analysis shown in Figure 1B

 109 436

VACLister ---------------------------------------------------

CML\_Ngv16 ---------------------------------------------------

CMLV\_Orig ---------------------------------------------------

CMLV\_CMS\_ ---------------------------------------------------

CPX\_Ger07 ---------------------------------------------------

CPXFM2292 ---------------------------------------------------

CPX\_Gri90 ---------------------------------------------------

CPX\_Aus99 ---------------------------------------------------

CPX\_Kos15 ---------------------------------------------------

CPX\_Fin00 ---------------------------------------------------

CPX\_Ger17 ---------------------------------------------------

CPX\_Rat09 ---------------------------------------------------

CPX\_Ger91 ---------------------------------------------------

CPX\_Ger02 ---------------------------------------------------

CPX\_Ger14 ---------------------------------------------------

CPX\_Ger10 ---------------------------------------------------

CPX\_Ger80 ---------------------------------------------------

CPX\_Ger98 ---------------------------------------------------

MPX\_USA03 ---------------------------------------------------

MPX\_Ivr71 ---------------------------------------------------

MPX\_Zre96 ---------------------------------------------------

MPX\_Con03 ---------------------------------------------------

MPX\_DRC07 ---------------------------------------------------

SDDIridoV ---------------------------------------------------

HSherpesV ---------------------------------------------------

Human\_LG4 ---------------------------------------------------

Mouse\_LG4 ---------------------------------------------------

NRat\_LFG4 ---------------------------------------------------

Cow\_LFG4\_ ---------------------------------------------------

Sheep\_LG4 ---------------------------------------------------

GrizzlyL4 ---------------------------------------------------

CAclionL4 ---------------------------------------------------

StClionL4 ---------------------------------------------------

WeddellL4 ---------------------------------------------------

Nfurseal4 ---------------------------------------------------

GShark\_L4 ---------------------------------------------------

betta\_LG4 ---------------------------------------------------

YlwPrchL4 ---------------------------------------------------

GHbreamL4 ---------------------------------------------------

Human\_LG1 MSHEKS-FLVSGDNYPPPNPGYPGGPQPP--MPPYAQPPYPGAPYPQPPFQ

Mouse\_LG1 MSHEKS-FLVSGDSYPPQNI---VGPQAP--MPPYVQAPYPGAPYPQAPFQ

NRat\_LFG1 MSHEKS-FLVSGDSYPPPNPGYPVGPQAP--MPPYVQPPYPGAPYPQAAFQ

Cow\_LFG1\_ MSHEKS-FLVSGDSYPPPNPGYPGGPQPS--MAPY-----PGAPYPQAPFQ

Nfseal\_L1 MPHEKS-FLVSGDSYPPPNSGYPGGPQPS--MPPY-----PVAPYPQAPFQ

WeddellL1 MPHEKS-FLVSGDSYPPPNPGYPGGPQPS--MPPY-----PGAPYPQAPFQ

CAslionL1 MPHEKS-FLVSGDSYPPPNSGYPGGPQPS--MPPY-----PVAPYPQAPFQ

Sheep\_LG1 MSHEKS-FLVSGDSYPPPNPGYPEGPQPS--MAPY-----PGAPYPQAAFQ

GrizzlyL1 MPHEKS-FLVSGDSYPPPNPGYPGGPQPS--MPPY-----PGAPYPQAPFQ

WhSharkL1 MSQEKT-YLVSGD---PQQPPY---PRNEMSYGNDHYPQQP-PPYGQPVFP

Betta\_LG1 MSQDKSGYPVMGETNPLHSNMY-GPPQPGFGMPPPNYSQAPGGPYPPA---

GHbreamL1 MSQDKSGYPIMGETNPLHNNVY-GPPQPGFGMPPPNYSQAPGGPYPPA---

YlwPrchL1 MSQEKSGYPVMGENNPLHNNVY-GPPQPGFGMPPPNYSQAPGGPYPPA---

Human\_LG2 MTQGKLSVANKAPGTEGQQ-QVH---GEKK--------EAPAVPSAPPSYE

Mouse\_LG2 MTQGKLSVANKAPGTEGQQHQAN---GEKK--------DAPAVPSAPPSYE

NRat\_LFG2 MTQGKLSVANKAPGTEGQQ-QAN---GEKK--------DAPAVPSAPPSYE

Cow\_LFG2\_ MTQGKLSVANKAPGTEGQQ-QAN---GEKK--------ETPAVPSAPPSYE

Sheep\_LG2 MTQGKLSVANKAPGTEGQQ-QAN---GEKK--------ETPAVPSAPPSYE

GrizzlyL2 MTQGKISVANKAPGTEGQQ-QAN---GEKK--------ETPAVPSAPPSYE

WeddellL2 MTQGKISVANKAPGTEGQQ-QAN---GEKK--------ETPAVPSAPPSYE

Nfseal\_L2 MTQGKISVANKAPGTEGQQ-QAN---GEKK--------ETPAVPSAPPSYE

CAslionL2 MTQGKISVANKAPGTEGQQ-QAN---G------------------------

WhSharkL2 ---------------------------------------------------

betta\_LG2 MKKGKVSDANE-----------------------------------PPSYQ

Asbass\_L2 MTQGKLSLANKA--TNGSS---S---GQAL--------VAPA----PPSYE

Ylwprh\_L2 MTKGKLSLANKA--TNGSF---S---EEAL--------VSPA----PPSYQ

GHbreamL2 MTQGKLSLANKS---NDSS---S---GQAL--------GTPS----PPSYE

Zfish\_LG2 M----------------------------------------SLPAAPPSYA

Human\_LG3 MSNPSAPPPYED-RNPL-------YPGP---PPPGGYGQPSVLPGGYPAYP

Mouse\_LG3 MSNPSAPPPYED-HNPL-------YPGS---PPPGGYGQPSVLPGGYPAYP

NRat\_LFG3 MSNPTAPPPYED-HNPL-------YPGR---PPPGGYGQPSVLPGGYPAYP

Cow\_LFG3\_ MSHPSAPPPYED-RSPL-------YPGS---PPPGGYGQPSVMPGGYP---

Sheep\_LG3 MSHASAPPPYED-RSPL-------YPGS---LPPGGYGQPSVVPGGYP---

Nfseal\_L3 MSNPSAPPPYED-RNPL-------YPGS---PPQGGYAQPSVLPGGYPPYP

CAslionL3 MSNPSAPPPYED-RNPL-------YPGS---PPQGGYAQPSVLPGGYPPYP

WeddellL3 MSNPSAPPPYED-RNPL-------YPGS---PPQGGYAQPFVLPGGYP---

GhSharkL3 MSRPTAPPSYEEATDLVMLPVHGEYPGNTVYPLPGSY-----SPTGKPGYP

Betta\_LG3 MSRSDYPPGYEDCHGPL-------YP------PQGGNYPAP-PPYGFPGY-

Asbass\_L3 MSRSDYPPGYDDSHGPL-------YA------PQGGSYPPP-PAYGFPAY-

GHbreamL3 MSRSDYPPGYDDSRGPM-------YA------PQGGNYPPP-PAYGFPAY-

YlwPrchL3 MSRSDYPPGYDDSRDLL-------YA------PQGGNYPPP-PAYGFPGF-

Zfish\_LG3 MSRSDFPPSYDDSRLLS-------NT------QPGPGYPPSAPPYGFSPY-

Human\_TB5 MLAARLVCLRTLPSRVFHPAF-T-----------------KASPVVKNSIT

Mouse\_TB5 MLAARLVCLRTLPSRVFQPTFIT-----------------KASPLVKNSIT

Rat\_TBIM5 MLAARLVCLRTLPSRVFQPTFIT-----------------KASPLVKNSIT

Cow\_TBIM5 MLAARLVCLRALPSRVFHPAF-T-----------------KASPVVKNSIT

Sheep\_TB5 MLAARLVCLRALPSRVFHPAF-T-----------------KASPAVKNSIT

GrizzlyT5 MLAARLLCLRTLPSRVFQPAF-T-----------------KASPIVKNSIT

Nfseal\_T5 MLAARFMCLRTLPSRVFQPAF-T-----------------KASPIVKNSIT

CAslionT5 MLAARFMCLRTLPSRVFQPAF-T-----------------KASPIVKNSIT

HIMonkST5 MLAARLVCLRTLPSRVFQPAF-T-----------------KASPIVKNSIT

GhSharkT5 MLVARFACLRNLPSLSLRPGL-T-----------------QGSVAWRNPSQ

betta\_TB5 MLVARLTCLRSLPLAGMRPVL-T-----------------HGSPALRAPTL

YlwPrchT5 MLVARLTCLRSLPLAGLRPVL-S-----------------QGSPALRAPTL

Asbass\_T5 MLVARLTCLRSLPLAGLRPVL-T-----------------QGSPALRTSTL

Zfish\_TB5 MLLCRLSCLRA-------PLGLR-----------------CAVPQGPRALI

Human\_TB6 ---------------------------------------------------

Mouse\_TB6 ---------------------------------------------------

Rat\_TBIM6 ---------------------------------------------------

cow\_TBIM6 ---------------------------------------------------

Sheep\_TB6 ---------------------------------------------------

GrizzlyT6 ---------------------------------------------------

CAslionT6 ---------------------------------------------------

Nfseal\_T6 ---------------------------------------------------

WeddellT6 ---------------------------------------------------

GhSharkT6 ---------------------------------------------------

Betta\_TB6 ---------------------------------------------------

YlwPrchT6 ---------------------------------------------------

AsBass\_T6 ---------------------------------------------------

GHbreamT6 ---------------------------------------------------

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-----------------------------------------MTS--------EKHSQSL--

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-----------------------------------------MAD-P-----DPRYPRSS--

-----------------------------------------MAD-T-----DPGYPRSS--

-----------------------------------------MAD-T-----DPRYPRSS--

-----------------------------------------MAD-F-----DPRYPCSS--

-----------------------------------------MAD-L-----DPRYPCSS--

-----------------------------------------MAD-P-----DPRYPCSS--

-----------------------------------------MAD-P-----DPRYPCSS--

-----------------------------------------MAD-P-----DPRYPCSS--

-----------------------------------------MAN-P-----DSRYPCSS--

-----------------------------------------MAD-S-----NPRYPCSS--

-----------------------------------------MEA--------EHYPRSS--

-----------------------------------------MSA--------EKYPRSS--

-----------------------------------------MSS--------ETYPRSS--

-----------------------------------------MSS--------EKYPRSS--

QPSPYGQPGYPHGPSPYPQGGYPQGPYPQGGYPQGPYPQEGYPQGPYPQGGYPQGPYPQ--

QPSPYGQPGYPHGPSPYPQGGYPQG--------------------PYPQGGYPQGPYPQ--

QPSPYGQPGYPHGPGPYPQGGYPQG--------------------PYPQGGYPQGPYPQ--

QPSPYGQPGYPQGPSPYPQGGYPQGPYPPGGYPQGPYPPGGYPQGPYPPGGYPQGPYPQ--

QPSPYGQPGYPQGPSSYPQGGYPQG----------PYPQGGYPQGPYPQGGYPQGPYPQ--

QPSPYGQPGYPQGPSSYPQGGYPQG----------PYPQGGYPQGPYPQGGYPQGPYPQ--

QPSPYGQPGYPQGPSSYPQGGYPQG----------PYPQGGYPQGPYPQGGYPQGPYPQ--

QPSPYGQPGYPQGPNPYPQGGYPQGLYPPGGYPQGPYPPGGYPQGPYPPGGYPQGPYPQ--

QSSPYGQPGYPQGPSSYPQGGYPQG----------PYPQGGYPQGPYPQGGYPQGPYPQ--

PQAGFGQPAFPSA--GYVQPPYPQSAYGQPG-----FPQGSYGE---PPQAFPQGAFQQ--

--AGYGQPGFPQAGPGFAPGPYPQM--------------------PYPQGPYPQGPYPQ--

--AGYGQPGFPQAGPGFAPGPYPQM--------------------PYPQMPYPQGPYPQ--

--AGYGQPGYPQAGPGFAPGPYPQM--------------------PYPQGPYPQGPY----

E--EATSGEGMKAGAF--------PPAPTA---VPLHPSWAYVD--------PSSSSSY--

E--EATSGEGLKAGTF--------PQGPTA---VPLHPSWAYVD--------PSGSSGY--

E--EATSGEGLKAGAF--------PQGPTA---VPLHPSWAYVD--------PSSSSGY--

E--EATSGEGLKAGAF--------PPAPSA---VPLHPSWAYVD--------PNSSSSY--

E--EATSGEGLKAGAF--------PPAPSA---MPLHPSWAYVD--------PNSNSSY--

E--EATSGEGLKAGAF--------PPAPSA---VPLHPSWAYVD--------P-SSSSY--

E--EATSGEGLKAGAF--------PPAPSA---VPLHPSWAYVD--------P-SSSSY--

E--EATSGEGLKAGAF--------PPAPSA---VPLHPSWAYVD--------P-SSSSY--

-------------------------------------------------------SSSY--

----------------------------------------GFTD-VFHLSLCSGRSPSY--

Q--EATAG--------------------------------------------------Y--

E--EATAG--------------------TS---AP-----CYND-V---------------

Q--EATEG--------------------TS---AP-----CYSD-V---------------

E--EATAG--------------------TS---AP-----CYND-V---------------

A--EATAGDKEQGSGSFTYASQPPPMPPPT---MPMHPSWAYVH-P---GPSPGYSNAY--

P--GYPQPGY-------------------G---HPA----GYPQ-PMP-------------

P--AYPQPGY-------------------G---HPA----GYPQ-PVP-------------

P--AYPQPGY-------------------G---HPA----GYPQ-PIP-------------

---AYPQPGY-------------------G---HPA----GYPQ-PMP-------------

---AYPQPGY-------------------G---HPA----GYPQ-PMP-------------

P--AYPQPGY-------------------G---HPA----GYPQ-PMP-------------

P--AYPQPGY-------------------G---HPA----GYPQ-PMP-------------

---AYPQPGY-------------------G---HPA----GYPQ-PMP-------------

P--PPDNMAYPPAGNMAYPPAGNMAYPPAGNMAYPPAGNVGYPP--AGNMGYPPGGMMG--

---SGPQPG--QPSAP--YPPGPNAPLYPG---QPG----GYPS----------------P

---GGPQPG--QPSAP--YPTGPNVPLYPG---QPG----GYP-----------------P

---GGPQPG--QPSAP--YPMGPNTPLYPG---QPG----GYP-----------------P

---GGPQPG--QPSAP--YPAGPNAPMYPG---QPG----GYPQ-GQPGGYPQGQPGGYPP

---EG-QPGYPQPNDP--YRGQPNDP-YRG---QPNDPYRGQPN-D---------------

T-------------------KN-QWLLTP---------SREYAT--KTRIGIRRGRTGQ--

T-------------------KN-QWLVTP---------SREYAT--KTRIRTHRGKTGQ--

T-------------------KN-QWLLTP---------SREYAT--KTRIRTHRGKTGQ--

T-------------------KN-QWLLTP---------SREYAT--KTRIGIRRGKTTQ--

T-------------------KN-QWLLTP---------SREYAT--KTRIGIRRGKTTQ--

T-------------------KN-QWLLTP---------SREYAT--KTRVGIRRGKIGQ--

T-------------------KN-QWLLTP---------SRQYAT--KTRVGIRRGKTGQ--

T-------------------KN-QWLLTP---------SRQYAT--KTRVGIRRGKTGQ--

T-------------------KN-QWLLTP---------SRQYAT--KTRVGIRRGKTGQ--

Q-------------------KTTQWLLQP---------KQGYAS--RPRFSLKRAKSVR--

L-------------------KACPPLVRP---------QQGYSS--KARFGFRRSRTTR--

L-------------------KACPPLLRP---------QQGYSS--KARFGFRRGKTTK--

L-------------------KACPPLLRP---------QQGFSS--KVRFGFRRGRTTR--

I-------------------RSPALMMRPQ--------QQGFSS--RVRLGLRRAKTPK--

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---------MAMPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MAIPSLYACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLYACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLYACSSIEDDFNYGS--SVASASV-----------------------

-----------MPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MATPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MATPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MATPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MATPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MATPSLSACSSIEDDFNYGS--SVASASV-----------------------

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---------MAMPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLSACSSIEDDFNYGS--SVASASV-----------------------

---------MAMPSLSARSSIEDDFNYGS--SVASASV-----------------------

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--V-EDDFNYG------TN-------------VATANI-----------------------

-------MLPSIPPKHYSIPLDD-FNYSS--SVAASSV-----------------------

--I-EDDFNYG------SS-------------VASATV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SC-------------VASASV-----------------------

--I-EDDFNYG------SN-------------VASASV-----------------------

--I-EDDFNYG------TN-------------VATASV-----------------------

--I-EDDFNYG------TN-------------VATASV-----------------------

--I-EDDFNYG------TN-------------VASASV-----------------------

SPFPPNP--YGQPQVFPGQDPDS-PQHGNYQEEGPPSYYD---NQ---D----FPATNWDD

SPFPPNP--YGQPPPF--QDPGS-PQHGNYQEEGPPSYYD---NQ---D----FPAVNWD-

SPFPPNP--YGQPPPF--QDPGS-PQHGNYQEEGPPSYYD---NQ---D----FPSVNWD-

SPFPPNP--YGQPQAFPAQDPGS-PHHGNYHEEGPPSYYD---NQ---D----FPATNWDD

SPFPPNP--YGQPQAFPAQDPGS-PQHGNYHEEGPPSYYD---NQ---D----FPATNWDD

SPFPPNP--YGQPQAFPAQDPDS-PQHGNYHEEGPPSYYD---NQ---D----FPATNWDD

SPFPPNP--YGQPQAFPAQDPGS-PQHGNYHEEGPPSYYD---NQ---D----FPATNWDD

SPFPPNP--YGQPQAFPAQDPGS-PHHGNYHEEGPPSYYD---NQ---D----FPATNWDD

SPFPPNP--YGQPQAFPAQDPGS-PQHGNYHEEGPPSYYD---NQ---D----FPATNWDD

PPMPPPP----------MMHSNVALGSPGYHDDVPPSYYD---NE---E----FSAANFED

GPYPQGPFQQGPAQPGFLGDPTGPATSPSYHGEGPPSYYD---NE---E----FTGSGFED

GPY-----QQGPGQPGFPGDPTVPAGSPGYHGDGPPSYYD---NE---E----FTNSGFED

--------QQGVAQPGFLSDPSA-VGSAGYHGDVPPSYYD---NE---E----FTNSGFED

----DNGFPTG------DH-------------ELFTTF-------------------SWDD

----EGGFPAG------HH-------------EHFTTF-------------------SWDD

----EGGFPAG------HH-------------ELFSTF-------------------SWDD

----ESGFPTG------DH-------------EFFTTF-------------------SWDD

----ESGFPTG------DH-------------EFFTTF-------------------SWDD

----ENGFPAG------DH-------------ELFTTF-------------------SWDD

----ENGFPAG------DH-------------ELFTTF-------------------SWDD

----ENGFPAG------DH-------------ELFTTF-------------------SWDD

----ENGFPAG------DH-------------ELFTTF-------------------SWDD

----GSGSFSG------ES-------------ELFSSF-------------------SWDD

------------------E-------------EMQVQF-------------------AWDD

--------------------------------EMLTEF-------------------TWDD

--------------------------------EMLTEF-------------------TWDD

--------------------------------EMLTEF-------------------TWDD

--AADMSSPFS------DP-------------SSSNSFDGLGS--------------NWED

-PTHPMPMNYG-PGHGYDG--------E--ERAVSDSFGPG-------E---------WDD

-PVHPMPMNYG---HDYNE--------E--ERAGSDSFRPG-------E---------WDD

-PVHPMPMNYG---HDYSE--------E--ERAGSDSFGPG-------E---------WDD

-PVHPMPMNYG-AGHGYDG--------G--ERAVSDTFGSG-------D---------WDD

-PVQPMPMNYG-PGHGYDG--------G--ERAVSDTFGSG-------D---------WDD

-PIHPMPMRYG-PGQGYDG--------E--ERAVSESFGPG-------E---------WDD

-PIHPMPMRYG-PGQGYDG--------E--ERAVSESFGPG-------E---------WDD

-PIHPMPMRYG-PGQGYDG--------E--ERAVSESFGPG-------E---------WDD

---APPAGSPGYPGGGFPIPPTLPLNPSW-PGPGSGPYGSSGSST-HPESE-GFTSSSWST

GPYPGQPYPPGHPGAGYPS-PPMPPVMP--PTIPTDVMSSG-------DDEFAASGSGWDS

GPYQGQPHPAGPPGAGYP--PPMPPVVP--PTIPSDVLSSG-------D-GFAASGSGWDS

GPYSGQPHPGGHPGAGYPSPPPMPPVIP--PTIPSDVLSSG-------D-EFAAHGSGWDS

GPYPGQPHPGGPPGAGYPSRPPMPPVMP--PTMPSDILSSG-------E-EFAASDSSWDS

-PYRGQP-------AGYP--PPAMPVIP--VMPPPGI---G-------DSEGFTTAEGFES

E-LKEAALEPSMEKIFKIDQMGRWFVAGG----AAVGLGALCYYGLGLSNEIGAIEKAVIW

E-LKEAALEPSMEKIFKIDQMGRWFVAGG----AAVGLGALCYYGLGMSNEIGAIEKAVIW

E-LKEAALEPSLEKVFKIDQMGKWFVAGG----AAVGLGALCYYGLGMSNEIGAIEKAVIW

E-LKEAALEPSVEKIFKIDQMGRWFIAGG----AAVGLGALCYYGLGMSNEIGAIEKAVIW

E-LKEAALEPSVEKIFKIDQMGRWFIAGG----AAVGLGALCYYGLGMSNEIGAIEKAVIW

E-LKEAAMEPSVEKIFKIDQMGRWVIAGG----AAVGLGALCYYGLGMSNEIGAIEKAVIW

E-LKEAAMEPSMEKIFKIDQMGRWFIAGG----AAVGLGALCYYGLGMSNEIGAIEKAVIW

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DQLKEAAFEPATDTAIRIDGMGRMVLAGG----AAVGLGALCYYGLGMSNEIGAIEKAVIW

DQLKEAAFEPATDTAIRIDSMGRMILAGG----AVVGLGALCYYGLGMSNDIGAIEKAMIW

EQLQDAALQ-NTHTASRVDSMGRVLLAGG----AAVGLGALCYYGLGMSSEIGAIEKAAIW

-----------------------------------MNIFDRKINF---D----ALLKFSHI

-----------------------------------MNIFDRKINF---D----ALLKFSHI

-----------------------------------MNIFDRKINF---D----ALLKFSHI

-----------------------------------MNIFDRKINF---D----ALFKFSHI

-----------------------------------MNIFDRKINF---D----ALFKFSHI

-----------------------------------MNIFDRKINF---D----ALLKFSHI

-----------------------------------MNIFDRKMNF---D----ALLKFSHI

-----------------------------------MNIFDRKINF---D----ALLKFSHI

-----------------------------------MNIFDRKINF---D----ALLKFSHI

-----------------------------------MNIFDRNTNI-------NALFKFSQI

-----------------------------------MNVFDRNINI---D----AVFKLSQI

-----------------------------------MNVFDRNINF---D----SLFKFSQI

-----------------------------------MNVFDRNINF---D----ALFKFSQI

-----------------------------------MNVFDRNINI---D----ALFKFSQI

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-HIRMAFLRKVYGILCLQFLLTTATTAVFLYFDCMRKFIQGSPVLIL---ASMFVSIGL--

-HIRMAFLRKVYGILCLQFLLTTATTAVFLYFDCMRKIIQGSPVLIL---ASMFVSIGL--

-HIRMAFLRKVYGILCLQFLLTTATTAVFLYFDCMRKFIQGSPVLIL---ASMFVSIGL--

-HIRMAFLRKVYGILCLQFLLTTATTAVFLYFDCMRTFIQGSPVLIL---ASMFGSIGL--

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-HIRMAFLRKVYGILCLQFLLTTATTAVFLYFDCTRTFIQGSPVLIL---ASMFGSIGL--

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-HIRMAFLRKVYGILCLQFLLTTATTAVFLYFDCMRTFIQGSPVLIL---ASMFGSIGL--

-HIRMAFLRKVYGILCLQFLLTTATTAVFLYFDCMRTFIQGSPVLIL---ASMFGSIGL--

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-KIRMTFIRRVYTLLSLQIILTISTTALFMFSKHLNAFVQDNSAVVF---VSAFSSFV---

-HIQLAFLRRVYGILLLQLLLTALVCILFLCFPIINTFLCTYPSIMA---ICPIISMVL--

-HIRMAFLRKVYSILSLQVLLTTVTSTVFLYFESVRTFVHESPALIL---LFALGSLG---

-HIRMAFLRKVYSILSLQVLLTTVTSALFLYFQALRTFVHESPALIV---VFALGSLG---

-HIRMAFLRKVYSILSLQVLLTTVTSALFLYFETLRTFVHDSPALIV---VFALGSLG---

-HIRMAFLRKVYSILSLQVLLTTVTLAFFLYFDSIRTFVHESPALIL---VLALGSLG---

-HIRMAFLRKVYSILSLQVLLTTVTSAIFLYFDSIRTFVHESPALIL---VLTLGSLG---

-HIRMAFLRKVYSILSLQVLLTTVTASFFLYFESIRTFVHESPALIL---VFALGSLG---

-HIRMAFLRKVYSILSLQVLLTTVTASFFIYFESIRTFVHESPALIL---VFALGSLG---

-HIRMAFLRKVYSILSLQVLLTTVTASFFIYFESIRTFVHESPALIL---VFALGSLG---

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-HIRMAFLRKVYSILSLQVLLTTVTASFFIYFESIRTFVHESPALIL---VFALGSLG---

-HIRMAFLRKVYTILSLQIILTTVTSAVFMYSDTIKDFIHTSPAFVL---VPALGSLG---

-QIRMDFLRKVYTLLSLQIILTTATSAVFMFSQTIKDFVHSSPAVVL---VSALGSLV---

-QIRMDFLRKVYTLLSLQIILTTATSALFMFSQPIKEFVHASPAVVL---VSALGSLV---

-QIRMDFLRKVYTLLSLQIILTTATSALFMFSHTIKEFVHASPAMVL---VSALGSLV---

KSIRQAFIRKVFLVLTLQLSVTLSTVSVFTFVAEVKGFVRENVWTYY---V----SYA---

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KSIRQAFIRKVFLVLTLQLSVTLSTVAIFTFVGEVKGFVRANVWTYY---V----SYA---

KSIRQAFIRKVFLVLTLQLSVTLSTVAVFTFVGEVKGFVRENVWTYY---V----SYA---

KSIRQAFIRKVFLVLTLQLSVTLSTVAVFTFVGKVKGFVRENVWTYY---V----SYA---

KSIRQAFIRKVFLVLTLQLSVTLSTVAVFTFVGKVKGFVRENVWTYY---V----SYA---

KSIRQAFIRKVFLVLTLQLSVTLSTVAVFTFVGKVKGFVRENVWTYY---V----SYA---

KSIRQAFIRKVFLVLTLQLSVTLSTVAVFTFVGEVKGFVRENVWTYY---V----SYA---

KSIRQAFIRKVFLVLTLQLSVTLSTVAVFTFVGKVKGFVRENVWTYY---V----SYA---

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KNIRQAFIRKVFLVLTVQLMVTFSFVAVFTFVDEAKDFVRKNPWTYY---V----SYA---

KSIRQAFIRKVFMVLTVQLMITFSFVAVFTFVNEAKFFVRRNPWTYY---V----SYA---

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KNIRRMFIRKVFCILMVQLMVTFSVVSLFTFCEPVRKFVQYNRVFYL---TSYMTFMG---

RKVRHTFIRKVYSIISVQLLITVAIIAIFTFVEPVSAFVRRN----------VAVYYVSYA

RKVRHSFIQKVYCIISVQLLITVAIIAIFTFVEPVGKYVRNN----------VAVYYVSYA

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RKVRHAFIRKVYTIISIQLLVTVAIIAVFTFVKPVGDFVRAN----------LAIYYASYA

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RKVRHTFIRKVYTIISIQLLITVAIIAIFTFVKPVGDFVRRN----------LYVYYVSYA

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LSIRHAFIRKVYLILASQLLVTTAIVAIFTFVEPVRLFVQRNQAVYW----ASYAVYA---

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LSIRHAFIRKVYLILAAQLLVTTAIVAVFTFVQPVRVFVQRNRAIYW----ASYGVYL---

LSIRHAFIRKVYLILASQLLVTTAIVAVFTFVQPVRYFVQKNQAIYW----ASYAVYI---

TDVRHSFIRKVYLILAAQLLVTAAVVAIFTFVEPVGLFVRKNPAIYW----VSYAIYF---

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PQYVKDRIHSTYMYLAGSIGLTALSALALARSPALMNFMMTGSWMTI---G---ATFAA--

PQYVKDRIHSTYMYLAGSIGLTALSAVAVSRTPALMNFMMRGSWITI---G---ATFAA--

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SHSTQVHLKNVYSSLAVCMFVAAAGSYVHVVTRLFQGGLLSVLGSLG---M----MFW---

SHSTQAHLKNVYASLAVCMFVAAAGAYVHVVTGLFQGGVLSVLGSLG---M----MFW---

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IFALTL--------HRHKHPLNLYLLCGFTLLESLTLASVVTFYDA----RIVMQAFMLTT

LMNVL-------VMYRHKRPVNSYLLVAFTFMEAVSVATTLTFYEY----STILQSLFLTC

LFALFL--------NKQNFPANMYLFVGFTLLEAINVAFFASFYNA----YTVIQAAFMTI

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LIFAL-------TLHRHTHPLNLYLLFAFTLSESLAVAAVVTFYDV----YLVLQAFIMTT

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LLLFL-------AIYRHQHPVNFYLLLVFTLLEAVSVATALTFYEY----STVLQALFLTC

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--MIGAGMLVQSISYEQSPGPKHLAWMLHSGVMGAVVAPLTILGGP----LLLRAAWYTAG

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--MIGAGMLVRSISYEHSPLPKHLAWMLHAGVMGAVIAPLTLLGGP----LMMRAAWYTAG

--LIGAGVLVRSVSYEHSPVAKHLSWALYAGVFGAVVAPLTLLGGP----LMLRAVWCTAG

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LMAT--------PHSHETEQKRLGLLAGFAFLTGVGLGPALELCIAINPSILPTAFMGTAM

LMAT--------PHSHETEQKRLGLLAGFAFLTGVGLGPALDLCIAINPSILPTAFMGTAM

LMAT--------PHSHETEQKRLGLLAGFAFLTGVGLGPALDLCIAINPSILPTAFMGTAM

LMTV--------PHSHETEQKRLGLLAGFAFLTGVGLGPALELCIAINPSILPTAFMGTAM

LMTT--------PHSHETEQKRLGLLAGFAFLTGVGLGPALELCIAINPSILPTAFMGTAM

LMTT--------PHSHETEQKRLGLLAGFAFLTGVGLGPALELCIAINPSILPTAFMGTAM

LMTT--------PHSHETEQKRLGLLAGFAFLTGVGLGPALELCIAINPSILPTAFMGTAM

LSFT--------PHNSETESKRLLILAGFAFFTGTGLGPIMDFVISVDPSIIPTSFLATAL

LAMT--------PHNPETEKKRLAILAGFAFLTGLGLGPTLDFVIAVNPSIIATAFMGTSV

LAMT--------PHNSKTEKKRLAILAGFAFLTGVGLGPTLDFVIAVNPSIIVTAFMGTSV

LAMT--------PHNPETEKKRLAILAGFAFFTGVGLGPTLDFVIAVNPSIIVTAFMGTSV

LAMT--------PHNPETEKKRLGMLAVFAFLTGVGLGPTLDFVIAVNPSIIMTAFMGTSM

AAFLALTTYTLQSKRDFSKLGAGLFAALWILILSGLLGI----F-VQNETVKLVLSAFGAL

AVFLALTAYTLQSKRDFSKLGAGLFVTLWILILSGLLRI----F-VQSETVELVLSAFGAL

AVFLALTAYTLQSKRDFSKLGAGLFVTLWILILSGLLRI----F-VQSETVELVLSAFGAL

AVFLALTAYTLQSKRDFSKLGAGLFVTLWILILSGLLRI----F-VQSETVELVLSAFGAL

AVFLALTTYTLQSKRDFSKLGAGLFATLWILILSGLLRI----F-VQNETVELVLSALGPL

AVFLALTTYTLQSKRDFSKLGAGLFATLWILILSGLLRI----F-VQNETVELVLSALGPL

AAFLALTTYTLQSKRDFSKLGAGLFAALWILILSGLLRI----F-VQNETVELVMSAFGAL

AAFLALTTYTLQSKRDFSKLGAGLFAALWILILSGLLRI----F-VQNETVELVLSAFGAL

AAFLALTTYTLQSKRDFSKLGAGLFAALWILILSGLLRI----F-VQNETVELALSAFGAL

AAFLALTTYTLQSKRDFSKLGAGLFAALWILILSGLLRI----F-VQNETVELVMSAFGAL

AAFLALTTYTLQSKRDFSKLGAGLFAALWILILSGLLGI----F-VQNETVELVLSAFGAL

AVFLALTTYTLQSKRDFSKLGAGLFAALWILILSGLLRI----F-VQNETVELVLSAFGAL

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AVFLALTTYTLQSKRDFSKLGAGLFATLWILILSGLLRI----F-VQNETVELVLSAFGAL

AVFLALTTYTLQSKRDFSKLGAGLFATLWILILSGLLRI----F-VQNETVELVLSAFGAL

AVFLALTTYTLQSKRDFSKLGAGLFATLWILILSGLLRI----F-VQNETVELVLSAFGAL

AVFLALTTYTLQSKRDFSKLGAGLFATLWILILSGLLRI----F-VQNETVELVLSAFGAL

AVFLALTTYTLQSKRDFSKLGAGLFATLWILILSGLLRI----F-VQNETVELVLSAFGAL

AVFLALTTYTLQSKRDFSKLVTGLFAAFWILILSGVLRI----K-FKIELIKNI-------

AVFLALTTYTLQSKRDFSKLVTGLFAAFWILILSGVLRI----K-FKIELIKNI-------

AVFLALTTCTLQSKRDFSKLVTGLFAAFWILILSGVLRI----K-FKIELIKNI-------

AVFLALTTCTLQSKRDFSKLVTGLFADFWILILSGVLRI----K-FKIELIKNI-------

AVFLALTTCTLQSKRDFSKLVTGLFAAFWILILSGVLRI----K-FKIELIKNI-------

AVFAGLTVYTFQSKKDFSKLGAGLFACILIFVIAMLIQL----F-YNSDSADLVISGFGAV

VAFTGLTVYTFQSTRNFSKLGAYLFSCLCVLCVGCILSMV---F--YNEILEIVLAAFGCF

TVFFGLTVYTLQSKKDFSKFGAGLFALLWILCLSGFLKF----F-FYSEIMELVLAAAGAL

AVFLGLTAYTLQSKRDFTKFGAGLFAGLWILCLAGFLKL----F-FYSETMELVLASLGAL

AVFLGLTAYTLQSKRDFSKFGAGLFACLWILCLAGFLKV----F-FYSQTVELVLASLGAL

AVFLGLTVYTLQSKRDFSKFGAGLFAGLWILCLSGILRL----F-FYSETVELVLAAGGAL

AVFLGLTVYTLQSKRDFSKFGAGLFAGLWILCLSGILRL----F-FYSETVELVLAAGGAL

AVFLGLTGYTLQSKRDFSKFGAGLFAVLWILCLSGILKL----F-FYSQTMELVLAAVGAL

AVFLGLTVYTLQSKRDFSKFGAGLFAVLWILCLSGILKL----F-FYSQTMELVLAAVGAL

AVFLGLTVYTLQSKRDFSKFGAGLFAVLWILCLSGILKL----F-FYSQTMELVLAAVGAL

AVFLGLTVYTLQSKRDFSKFGAGLFAVLWILCLSGILKL----F-FYSQTMELILAAVGAL

AVFLGLTVYTLQSKRDFSKFGAGLFAVLWILCLSGILKL----F-FYSQTMELVLAAVGAL

AVFLGLTSYTFQSKRDFSKYGAGLFACLWILILAGFFRL----F-FFSETMELVFASAGAL

AVFAGLTAYTFQSKRDFSKLGAGLFACLWILIIASFMRF----F-FNSDSTELVFAGAGAL

AVFAGLTVYTLQSKRDFSKMGAGLFACLWILLIASFMRL----F-FNSDGTELVMAGAGAL

AVFVGLTAYTFQSKRDFSKMGAGLFACLWILVIASFMRF----F-FNNDSTEVVLAGAGAL

AVCFTVVIFSMQTRYDFTSCMGVLLVSMVVLFIFAILCI----F-IRNRILEIVYASLGAL

AVCFTVVIFSMQTRYDFTSCMGVLLVSVVVLFIFAILCI----F-IRNRILEIVYASLGAL

AVCFTVVIFSMQTRYDFTSCMGVLLVSVVVLFIFAILCI----F-IRNRILEIVYASLGAL

TVCFTVVIFSMQTRYDFTSCVGVLLVSVVVLILFAILCI----F-IRSRVLEIVYASLGAL

TVCFTVVIFSMQTRYDFTSCMGVLLVSLVVLVIFAILCI----F-IRNRILEIVYASLGAL

TVCFTVVIFSMQTRYDFTSCMGVLLVSLVVLVIFAILCI----F-IRNRILEIVYASLGAL

TVCFTVVIFSMQTRYDFTSCMGVLLVSLVVLVIFAILCI----F-IRNRILEIVYASLGAL

TVCFTVVIFSMQTRYDFTSCVGVLLVSVVVLILFAILCI----F-IRSRVLEIVYASLGAL

TVCFTVVIFSMQTRYDFTSCMGVLLVSLVVLVVFAVLCI----F-IRNRILEIVYASLGAL

AVCFTVVIFSMQTKYDFTSCMGVMLVSVVVLFFFGILCI----F-IQNKILQIVYASVGAL

VVCFTVVLFSLQSKYDFTSCRGVLFVCLIVLLLFSILCI----F-IRDKILHIVYASLGAL

VVCFTVVLFSLQSKYDFTSCRGVLFVCLIVLLLFSFLCI----F-IRHKILHIVYASLGAL

VVCFTVVLFSLQSKYDFTSCRGVLFVCLIVLLLFSILCI----F-IRHRILHIVYASLGAL

LVCLSVTVFSFQTKFDFTSCQGVLFVLLMTLFFSGLILAILLPF-QYVPWLHAVYAALGAG

LVCLSVTIFSFQTKFDFTSCQGVLFVLLMTLFFSGLLLAVLLPF-QYVPWLHAVYAVLGAG

LVCLSVTIFSFQTKFDFTSCHGVLFVLLMTLFFSGLLLAILLPF-QYVPWLHAVYAVLGAG

LVCLSVTVFSFQTKFDFTSCQGVLFVLLMTLFFSGLILAILLPF-QYVPWLHAVYAVLGAG

LVCLSVTVFSFQTKFDFTSCQGVLFVLLMTLFFSGLILAILLPF-QYVPWLHAVYAVLGAG

LVCLSVTVFSFQTKFDFTSCQGVIFVLLMTLFFSGLILAILLPF-QYVPWLHAVYAVLGAG

LVCLSVTVFSFQTKFDFTSCQGVIFVLLMTLFFSGLILAILLPF-QYVPWLHAVYAVLGAG

LVCLSVTVFSFQTKFDFTSCQGVIFVLLMTLFFSGLILAILLPF-QYVPWLHAVYAVLGAG

LVCLSVTVFSFQTKFDFTSCQGVIFVLLMTLFFSGLILAILLPF-QYVPWLHAVYAVLGAG

LVCLAVTIFSFQTKFDFTSCHGVLFVLLIVLCISGLVLAIVLPF-QYVPWLHAVYAVLGAI

LVCLSVTVFSFQSKVDVTSCQGILFSLCMVMLLCAITLSIVVPF-GYVPWLHAIYAVLGAI

AVCLLVTIFSFQTKFDVTSYQGVLFVFCMVMFISGLVLALVLPF-QYVPWLDAIYAALGAI

AVCLLVTVFSFQTKFDVTSYQGVLFVFCMVMFVSGLVLALVLPF-QYVPWLDATYAVLGAI

AVCLLVTVFSFQTKFDVTSYQGVLFVFCTVMFISGLVLAFILPF-QYVPWLDGIFAALGAI

LVCLAITLFCFQSRVDFTTCHGLLFSLMMVLMITGLLLFFTAPF-GYIPWLHTAYAGFGAL

VVSISVTIFCFQTKVDFTSCTGLFCVLGIVLLVTGIVTSIVLYF-QYVYWLHMLYAALGAI

VVSISVTIFCFQTKVDFTSCTGLFCVLGIVLMVTGIVTSIVLIF-KYIYWLHMVYAALGAI

VVSISVTIFCFQTKVDFTSCTGLICVLGIVLAVTGAVTSVVLFF-EYIYWLHMVYAGLGAI

VVSISVTIFCFQTKVDFTSCTGLFCVLGIVMTVTGIITVIVLVF-KYVYWLHMVYAALGAI

VVSISVTIFCFQTKVDFTSCTGLFCVLAIVMVVTGIITAIVLAF-KYVYWLHMVYAAVGAI

VVSISVTIFCFQTKVDFTSCTGLFCVLGIVMMVTGIVTAIVLSF-KYIYWLHMVYAALGAI

VVSISVTIFCFQTKVDFTSCTGLFCVLGIVMMVTGIVTAIVLSF-KYIYWLHMVYAALGAI

VVSISVTIFCFQTKVDFTSCTGLFCVLGIVMMVTGIVTAIVLSF-KYIYWLHMVYAALGAI

LVCLGVTLFCFQTKVDFTSCTGLFCALGIGLFVGGIVISIVLSF-KYIPWLHSLYAAAAAV

VVCVAVTVFCFQTKVDFTKCQGLFCVLGIVIFVLGIITAIVLSF-KYIPWLHMLYAALGAI

VVCIAVTVFCFQTKVDFTKCQGLFCVLGIVIFVTGIITTIVLSF-KYILWLHMLYAALGAI

VVCIAVTVFCFQTKVDFTKCQGLFCVLGIVMFVTGIITCIVLSF-KYIPWLHMLYAAMGAI

VVCIAVTVFCFQTKVDFTKCQGLFCVLGIVMLLTGIIATIVLSF-KYILWLHMLYAAMGAI

VVCVAVTVFCFQTKVDFTKCSGFFCVLGIVVFVTGIITAIVLSF-KYVPWLHMLYASIGAI

IVGGLSTVAMCAPSEKFLNMGAPLGVGLGLVFVSSLGSMFLPPTTVAGATLYSVAMYGGLV

IVGGLSTVAMCAPSEKFLNMGAPLGVGLGLVFASSLGSMFLPPTSVAGATLYSVAMYGGLV

IVGGLSTVAMCAPSEKFLNMGAPLGVGLGLVFASSLGSMFLPPTSVAGATLYSVAMYGGLV

IVGGLSTVAMCAPSEKFLNMGAPLGVGLGVVFVSSLGSMFLPPTTVAGATLYSVAVYGGLV

IVGGLSTVAMCAPSEKFLNMGAPLGVGLGVVFVSSLGSMFLPPTTVAGATLYSVAVYGGLV

IVGGLSTVAMCAPSEKFLNMGAPLGVGLGLVFVSSLGSMFLPPTTVAGATLYSVAIYGGLV

IVGGLSAVAVCAPSEKFLNMGAPLGVGLGLVFVSSLGSMFLPPTTVAGATLYSVAIYGGLV

IVGGLSAVAVCAPSEKFLNMGAPLGVGLGLVFVSSLGSMFLPPTTVAGATLYSVAIYGGLV

IVGGLSAVAMCAPSEKFLNMGAPLGVGLGLVFVSSLGSMFLPPTTVAGATLYSVAIYGGLV

IVGGLSTVAMCAPSEKFLNIGGPLAIGLGFVFASSVGSMFLPPTSMLGAGLYSVAIYGGLV

IVGGLSTVAMCAPSEKFLNMGGPLAVGFGVVFASSLGSMFLPPTSAFGAGLYSVAIYGGLV

IVGGLSTVAMCAPSEKFLNMGGPLAVGFGVVFASSIGSMFLPPTSAFGAGLYSVAIYGGLV

IVGGLSTVAVCAPSEKFLNMGGPLAVGFGVVFASSIGSMFLPPTSAFGAGLYSVAVYGGLV

VVGGLSTVAVCAPSERFLNMGGPLAVGLGLVLASTLGSMFLPPSTAVGAGLYSVSVYGGLL

IFTCFTLSALYARRRSYLFLGGILMSALSLLLLSSLGNV----F-FGSIWLFQANLYVGLV

IFTCFSLSALYARRRSYLFLGGILMSAMSLMLLSSLGNL----F-FGSIWLFQANLYLGLL

IFTCFSLSALYARRRSYLFLGGILMSAMSLMFVSSLGNL----F-FGSIWLFQANLYMGLL

IFTCFTLSALYARRRSYLFLGGILMSAMSLMLLSSLGNL----F-FGSVWLFQANLYMGLV

IFTCFTLSALYARRRSYLFLGGILMSAMSLMLLSSLGNL----F-FGSVWLFQANLYMGLV

IFTCFTLSALYARRRSYLFLGGVLMSAMSLMLLSSLGNL----F-FGSIWLFQANLYVGLV

IFTCFTLSALYARRRSYLFLGGVLMSAMSLMLLSSLGNL----F-FGSIWLFQANLYVGLV

IFTCFTLSALYARRRSYLFLGGVLMSAMSLMLLSSLGNL----F-FGSIWLFQANLYVGLV

IFTCFTLSALYARRRSYLFLGGVLMSAMSLMLLSSLGNL----F-FGSIWLFQANLYVGLV

IFSCFTLSALYAQRRSYLFLGGILMSCLTVLCFLPLINLL---F--GSMLLFKVNGRRTFL

IFICFSLSALYAKRRSYLFLGGTLMSGLSFLFLLSVMNI----F-FGSLMLFKAHMYLGLL

IFICFTLSALYAKRRSYLFLGGTLMSGLSLLFLMSVMNM----F-FGSVMVFKAHMYLGLL

IFICFTLSALYAKRRSYLFLGGTLMSGLSILFLMSLMNM----F-FGSLMLFKAHMYLGLL

IFICFSLSALYAKRRSYLFLGGTLMSGLSLLFLMSVMNM----F-FGSVMLFKAHMYLGLL

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINLYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEDYVLASINFYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEDYVLASINFYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEDYVLASINFYLDIINLF

-----------------------YSADSL--------------------------------

-----------------------YSADSL--------------------------------

V----------------FCGFIIYDTHSLIHKLS-------------LKSMC---------

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINLYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINLYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINLYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINFYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINFYLDIINLF

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V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINFYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINFYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINLYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINFYLDIINLF

V----------------FCGFIIYDTHSLIHKLS--------PEEYVLASINFYLDIINLF

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V----------------FCGFIIYDTHKLMKQ--------FSPDEYIVAFIHIYMDIIDLF

L----------------FCGFIIYDTYSLMHRVS--------PEDYLEAVIHLYLDIIILF

L----------------FCGFIIYDTHSLMHK--------LSPEEYVLAAISLYLDIINLF

L----------------FCGFIIYDTHSLMHR--------LSPEEYVIAAISLYMDIINLF

L----------------FCGFIIYDTHSLMHR--------LSPEEYVLAAISLYLDIINLF

L----------------FCGFIIYDTHSLMHR--------LSPEEYVLAAINLYLDIINLF

L----------------FCGFIIYDTHSLMHR--------LSPEEYVLAAINLYLDIINLF

L----------------FCGFIIYDTHSLMHR--------LSPEEYVLAAISLYLDVINLF

L----------------FCGFIIYDTQSLMHR--------LSPEEYVLAAISLYLDVINLF

L----------------FCGFIIYDTHSLMHR--------LSPEEYVLAAISLYLDVINLF

L----------------FCGFIIYDTHSLMHK--------LSPEEYVLAAISLYLDVINLF

L----------------FCGFIIYDTHSLMHR--------LSPEEYVLAAISLYLDVINLF

L----------------FCGFIIYDTHVLMHK--------LSPEEYILASINLYLDIINLF

V----------------FCGFIIYDTHLLMKQ--------LSPEEHILASINLYLDIVNLF

V----------------FCGFIIYDTHLLMKQ--------LSPEEHILASINLYLDIVNLF

I----------------FCGFIIYDTNLLMKQ--------LSPEEHILASINLYLDIVNLF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKQ----LSLSPEEYVFAALNLYTDIINIF

I----------------FTVVSSWPLPL--------------PQWDIFKL-----------

L----------------FTCFLAVDTQLLLGNKK----LSLSPEEYIFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKK----LALSPEEYIFAALNLYTDIINIF

L----------------FTCFLAVDTQLLLGNKK----MSLSPEEYIFAALNLYTDIINIF

V----------------FTLFLALDTQLLMGNRR----HSLSPEEYIFGALNIYLDIIYIF

V----------------FTLFLAFDTQLLMGNRR----HSLSPEEYIFGALNIYLDIIYIF

V----------------FTLFLAFDTQLLMGNRR----HSLSPEEYIFGALNIYLDIIYIF

V----------------FTLFLAFDTQLLMGSRR----HSLSPEEYIFGALNIYLDIIYIF

V----------------FTLFLAFDTQLLMGSRR----HSLSPEEYIFGALNIYLDIIYIF

V----------------FTLFLAFDTQLLMGNRR----HSLSPEEYIFGALNIYLDIVYIF

V----------------FTLFLAFDTQLLMGNRR----HSLSPEEYIFGALNIYLDIIYIF

V----------------FTLFLAFDTQLLMGNRR----HSLSPEEYIFGALNIYLDIIYIF

V----------------FTLFLAFDTQLLMGNRR----HSLSPEEYIFGALNIYLDIIYIF

I----------------FTMFLAFDTQLLIGNRR----YAISPEEYIFGALNIYLDIIYIF

L----------------FTLFLAFDTQLLLGNKR----YTISPEEYVFATLSIYLDIVYLF

L----------------FTMFLAFDTQLLMGNKR----YTMSPEEYVFATLNIYLDIIYIF

L----------------FTMFLAFDTQLLMGNKR----YTMSPEEYVFATLNLYLDIIYIF

L----------------FTMFLAFDTQLLMGNKR----YTMSPEEYVFATLNIYLDIIYIF

V----------------FTLFLAFDMQLLIGNRR----YSLNPEEHVFGAICLYMDVVYIF

C----------------FTLFLAYDTQLVLGNRK----HTISPEDYITGALQIYTDIIYIF

C----------------FTLFLAYDTQLVLGNRK----HTISPEDYITGALQIYTDIVYIF

C----------------FTLFLAYDTQLVLGNRK----HTISPEDYITGALQIYTDIVYIF

C----------------FTLFLAYDTQMVLGNRK----HTISPEDYITGALQIYTDIVYIF

C----------------FTLFLAYDTQMVLGNRR----HSISPEDYITGALQIYTDIVHIF

C----------------FTLFLAYDTQLVLGNRK----HTISPEDYITGALQIYTDIIYIF

C----------------FTLFLAYDTQLVLGNRK----HTISPEDYITGALQIYTDIIYIF

C----------------FTLFLAYDTQLVLGNRK----HTISPEDYITGALQIYTDIIYIF

I----------------FTLFLAFDTQLILGNRK----HSISPEEYVYAALRLYTDMVQIF

I----------------FTMFLAYHTQLLIGNRK----HSISPEEYVFAALSIYVDIVQIF

V----------------FTMFLAYHTQLLIGNRK----HSISPEEYVFAALSIYVDIIQIF

A----------------FTLFLAYHTQLLIGNRK----HSIGPEEYVFAALSIYVDIVQIF

V----------------FTMFLAYHTQLLIGNRK----YNISPEEYVFAALSIYVDIIQIF

A----------------FTLFLAYHTQLLIGNRK----LSISPEEYVFAALSLYVDIVQIF

L----------------FSMFLLYDTQKVIKRAEVSPMYGVQKYDPINSMLSIYMDTLNIF

L----------------FSMFLLYDTQKVIKRAEITPMYGAQKYDPINSMLTIYMDTLNIF

L----------------FSMFLLYDTQKVVKRAEITPAYGAQKYDPINSMLTIYMDTLNIF

L----------------FSMFLLYDTQKVIKRAEVVPMYGVQKYDPINSMLGIYMDTLNIF

L----------------FSMFLLYDTQKVIKRAEVVPMYGVHKYDPINSMLGIYMDTLNIF

L----------------FSMFLLYDTQKVIKRAEIIPAYGVQKYDPINSMLGIYMDTLNIF

L----------------FSMFLLHDTQKVIKRAEIIPAYGVQKYDPINSMLGIYMDTLNIF

L----------------FSMFLLHDTQKVIKRAEIIPAYGVQKYDPINSMLGIYMDTLNIF

V----------------FSMFLLYDTQKVIKRAEIIPAYGVQKYDPINSMLGIYMDTLNIF

L----------------FGMFLLYDTQKVIKQAESFPVYAVQKFDPINACIGIYMDTLNIF

L----------------FSMFLLYDTQKVIKRAETHPLYGVQKYDPINACMGIYMDTLNIF

L----------------FSMFLLYDTQKVIKRAETHPLYGVQKYDPINACMGIYMDTLNIF

L----------------FSMFLLYDTQKVIKRAETYPVYGVQKYDPINACMGIYMDTLNIF

L----------------FSLFLLYDTQKVIKRAETHPLYSAHKYDPINASLGIFIDTINIF

V----------------MCGFVLFDTQLIIEKAE----H--GDQDYIWHCIDLFLDFITVF

V----------------MCGFVLFDTQLIIEKAE----H--GDKDYIWHCVDLFLDFVTLF

V----------------MCGFVLFDTQLIIEKAE----H--GDKDYIWHCIDLFLDFVTLF

V----------------MCGFVLFDTQLIIEKAE----N--GDKDYIWHCVDLFLDFVTLF

V----------------MCGFVLFDTQLIIEKAE----N--GDKDYIWHCIDLFLDFVTLF

V----------------MCGFVLFDTQLIIEKAE----N--GDKDYIWHCVDLFLDFITLF

V----------------MCGFVLFDTQLIIEKAE----N--GDKDYIWHCVDLFLDFITLF

V----------------MCGFVLFDTQLIIEKAE----N--GDKDYIWHCVDLFLDFITLF

V----------------MCGFVLFDTQLIIEKAE----N--GDKDYIWHCVDLFLDFITLF

TPPPPKKCPAVPCACFPFCCSLTNN------------------------------------

V----------------MCGFVLFDTQLIIEKAE----N--GDKDYVWHCVDLFLDFITIF

I----------------MCGFVLFDTQLIIEKAE----N--GDKDYIWHCVDLFLDFITIF

I----------------MCGFVLFDTQLIIEKAE----N--GDKDYVWHCVDLFLDFVTIF

I----------------MCGFVLFDTQLIIEKAE----N--GDKDYVWHCVDLFLDFITIF

LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

-------SMTRTH------

-------SMTRTH------

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LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

LHLLQLLEVSNRK------

LHLLQLLEVSNKK------

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LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

LHLLQLLEVSNKK------

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MRILHILKSIKNQ------

MDFLRILGESKSESKSITV

LHLLRFLEAVNKK------

LHLLKFLEAVNKK------

LHLLKFLDAVNKK------

LHLLRVLEAANKK------

LHLLRVLEAVNKK------

LHLLRFLEAVQKK------

LHLLRFLEAVNKK------

LHLLRFLEAVNKK------

LHLLRFLEAVNKK------

LHLLRFLEAVNKK------

LHILRILESINKK------

LHILRVLDSMKKH------

LHILRLLDSMKKH------

LHILRLLDSMKKH------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

LYILTIIGRAKE-------

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LYILAIVGRSRE-------

LYILAIVGRSRE-------

LYILTIVGRSRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFFLQLFGTNRE-------

TFMLQIFGSNRE-------

SFLLQLTGQGRD-------

SFFLQIFGTKQE-------

SFFLQIFGTKQE-------

SFFLQIFGTKRE-------

LFFLQLFGS-RE-------

TFVLQLMGDRN--------

TFVLQLVGSRD--------

TFVLQLVGNRD--------

TFVLQLVGSRD--------

TFVLQLVGRQD--------

TFVLQLVGDRN--------

TFVLQLVGDRN--------

TFMLQLVGDRN--------

INLLQLFGSRE--------

LFLLQIIGASTK-------

LFLLQIIGASTK-------

IFLLQIIGAATK-------

LFLLQIIGASTK-------

IFLLQIIGYAER-------

MRVATMLATGG-NRKK---

MRVATMLATGS-NRKK---

MRVATMLATGS-NRKK---

MRVATILATGG-NRKK---

MRVASILATGG-NRKK---

MRVASILATGS-NRKK---

MRVASILATGG-NRKK---

MRVASILATGG-NRKK---

MRVASILATGS-NRKK---

IRVAAMLGNGGGSSRK---

MRLVMILANGGGSRRK---

MRLVMILANGGGGKRK---

MRLVMILANGGGSRRK---

MRLVMILSGAG-SRRK---

RKLMMILAMNEKDKKKEKK

RKLMLILAFNEKDKKKEKK

RKLMLILAFNEKDKKKEKK

RKLMMILAMNEKDKKKKK-

RKLMMILAMNEKDKKKKK-

RKLMMILAMNEKDKKKEKK

RKLMMILAMNEKDKKKEKK

RKLMMILAMNEKDKKKEKK

RKLMMILAMNEKDKKKEKK

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RKLMVILALNDKDKKKEKK

RKLMVILAMNDKEKKKEKK

RKLMVILALNDKDKKKEKK

RKLMVILAMNDKDKKKEKK

**Supplementary sequences:**

piggybac\_SLP-mCherry-K3L:

actcttcctttttcaatattattgaagcatttatcagggttattgtctcatgagcggatacatatttgaatgtatttagaaaaataaacaaataggggttccgcgcacatttccccgaaaagtgccacctaaattgtaagcgttaatattttgttaaaattcgcgttaaatttttgttaaatcagctcattttttaaccaataggccgaaatcggcaaaatcccttataaatcaaaagaatagaccgagatagggttgagtgttgttccagtttggaacaagagtccactattaaagaacgtggactccaacgtcaaagggcgaaaaaccgtctatcagggcgatggcccactacgtgaaccatcaccctaatcaagttttttggggtcgaggtgccgtaaagcactaaatcggaaccctaaagggagcccccgatttagagcttgacggggaaagccggcgaacgtggcgagaaaggaagggaagaaagcgaaaggagcgggcgctagggcgctggcaagtgtagcggtcacgctgcgcgtaaccaccacacccgccgcgcttaatgcgccgctacagggcgcgtcccattcgccattcaggctgcgcaactgttgggaagggcgatcggtgcgggcctcttcgctattacgccagctggcgaaagggggatgtgctgcaaggcgattaagttgggtaacgccagggttttcccagtcacgacgttgtaaaacgacggccagtgagcgcgcctcgttcattcacgtttttgaacccgtggaggacgggcagactcgcggtgcaaatgtgttttacagcgtgatggagcagatgaagatgctcgacacgctgcagaacacgcagctagattaaccctagaaagataatcatattgtgacgtacgttaaagataatcatgcgtaaaattgacgcatgtgttttatcggtctgtatatcgaggtttatttattaatttgaatagatattaagttttattatatttacacttacatactaataataaattcaacaaacaatttatttatgtttatttatttattaaaaaaaaacaaaaactcaaaatttcttctataaagtaacaaaacttttatgagggacagcccccccccaaagcccccagggatgtaattacgtccctcccccgctagggggcagcagcgagccgcccggggctccgctccggtccggcgctccccccgcatccccgagccggcagcgtgcggggacagcccgggcacggggaaggtggcacgggatcgctttcctctgaacgcttctcgctgctctttgagcctgcagacacctggggggatacggggaaaaGGCCTCCACGGCCAGACTAGAACTTTTAAAAGAAAAGGGGGGATTGGGGGGTACAGTGCAGGGGAAAGAATAGTAGACATAATAGCAACAGACATACAAACTAAAGAATTACAAAAACAAATTACAAAAATTCAAAATTTTATCGATCACGAGACTAGCCTCGAGGGATCatccggtgcccgtcagtgggcagagcgcacatcgcccacagtccccgagaagttggggggaggggtcggcaattgaacgggtgcctagagaaggtggcgcggggtaaactgggaaagtgatgtcgtgtactggctccgcctttttcccgagggtgggggagaaccgtatataagtgcagtagtcgccgtgaacgttctttttcgcaacgggtttgccgccagaacacagctgaagcttcgaggggctcgcatctctccttcacgcgcccgccgccctacctgaggccgccatccacgccggttgagtcgcgttctgccgcctcccgcctgtggtgcctcctgaactgcgtccgccgtctaggtaagtttaaagctcaggtcgagaccgggcctttgtccggcgctcccttggagcctacctagactcagccggctctccacgctttgcctgaccctgcttgctcaactctacgtctttgtttcgttttctgttctgcgccgttacagatccaagctgtgaccggcgccGAATTCCTTCAGGGTGAGTTTGGGGACCCTTGATTGTTCTTTCTTTTTCGCTATTGTAAAATTCATGTTATATGGAGGGGGCAAAGTTTTCAGGGTGTTGTTTAGAATGGGAAGATGTCCCTTGTATCACCATGGACCCTCATGATAATTTTGTTTCTTTCACTTTCTACTCTGTTGACAACCATTGTCTCCTCTTATTTTCTTTTCATTTTCTGTAACTTTTTCGTTAAACTTTAGCTTGCATTTGTAACGAATTTTTAAATTCACTTTTGTTTATTTGTCAGATTGTAAGTACTTTCTCTAATCACTTTTTTTTCAAGGCAATCAGGGTATATTATATTGTACTTCAGCACAGTTTTAGAGAACAATTGTTATAATTAAATGATAAGGTAGAATATTTCTGCATATAAATTCTGGCTGGCGTGGAAATATTCTTATTGGTAGAAACAACTACATCCTGGTCATCATCCTGCCTTTCTCTTTATGGTTACAATGATATACACTGTTTGAGATGAGGATAAAATACTCTGAGTCCAAACCGGGCCCCTCTGCTAACCATGTTCATGCCTTCTTCTTTTTCCTACAGCTCCTGGGCAACGGTACCGGATCCCTGCAGAAGCTTCTAAAAATTGAAATTTTATTTTTTTTTTTTGGAATATAAATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCTCAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCCGACATCCCCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTGCGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAACAGTACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACGAGCTGTACAAGTCTAGATCTGCCACCATGCTTGCATTTTGTTATTCGTTGCCCAATGCGGGTGATGTAATAAAGGGCAGAGTATACGAGAAGGATTATGCTCTATATATTTATCTTTTTGACTATCCTCACTTTGAAGCTATCTTGGCAGAGAGTGTTAAGATGCATATGGATAGATATGTTGAATATAGGGATAAACTGGTAGGGAAAACTGTAAAAGTTAAAGTGATTAGAGTTGATTATACAAAAGGATATATAGATGTCAATTACAAAAGGATGTGTAGACATCAATAATAgCGGCCGCCTAaacttgtttattgcagcttataatggttacaaataaagcaatagcatcacaaatttcacaaataaagcatttttttcactgcattctagttgtggtttgtccaaactcatcaatgtatcttatcatgtctGGATCCggcctccgcgccgggttttggcgcctcccgcgggcgcccccctcctcacggcgagcgctgccacgtcagacgaagggcgcagcgagcgtcctgatccttccgcccggacgctcaggacagcggcccgctgctcataagactcggccttagaaccccagtatcagcagaaggacattttaggacgggacttgggtgactctagggcactggttttctttccagagagcggaacaggcgaggaaaagtagtcccttctcggcgattctgcggagggatctccgtggggcggtgaacgccgatgattatataaggacgcgccgggtgtggcacagctagttccgtcgcagccgggatttgggtcgcggttcttgtttgtggatcgctgtgatcgtcacttggtgagtagcgggctgctgggctggccggggctttcgtggccgccgggccgctcggtgggacggaagcgtgtggagagaccgccaagggctgtagtctgggtccgcgagcaaggttgccctgaactgggggttggggggagcgcagcaaaatggcggctgttcccgagtcttgaatggaagacgcttgtgaggcgggctgtgaggtcgttgaaacaaggtggggggcatggtgggcggcaagaacccaaggtcttgaggccttcgctaatgcgggaaagctcttattcgggtgagatgggctggggcaccatctggggaccctgacgtgaagtttgtcactgactggagaactcggtttgtcgtctgttgcgggggcggcagttatggcggtgccgttgggcagtgcacccgtacctttgggagcgcgcgccctcgtcgtgtcgtgacgtcacccgttctgttggcttataatgcagggtggggccacctgccggtaggtgtgcggtaggcttttctccgtcgcaggacgcagggttcgggcctagggtaggctctcctgaatcgacaggcgccggacctctggtgaggggagggataagtgaggcgtcagtttctttggtcggttttatgtacctatcttcttaagtagctgaagctccggttttgaactatgcgctcggggttggcgagtgtgttttgtgaagttttttaggcaccttttgaaatgtaatcatttgggtcaatatgtaattttcagtgttagactagtaaattgtccgctaaattctggccgtttttggcttttttgttagacgctagcggatAGCGCTTCTCATTGGGCATTCCAGCCTACCCAGCTCGGAGTTAGTTACTCCGTAAGTGTGGCCGGAACAGAGTTCGTCCATCTAAAAAGGGAGGGGACCGGCGAACACATCTAGAGCCACCATGGCCACCGAGTACAAGCCCACGGTGCGCCTCGCCACCCGCGACGACGTCCCCCGGGCCGTACGCACCCTCGCCGCCGCGTTCGCCGACTACCCCGCCACGCGCCACACCGTCGAYCCGGACCGCCACATCGAGCGGGTCACCGAGCTGCAAGAACTCTTCCTCACGCGCGTCGGGCTCGACATCGGCAAGGTGTGGGTCGCGGACGACGGCGCCGCGGTGGCGGTCTGGACCACGCCGGAGAGCGTCGAAGCGGGGGCGGTGTTCGCCGAGATCGGCYCGCGCATGGCCGAGTTGAGCGGTTCCCGGCTGGCCGCGCAGCAACAGATGGAAGGCCTCCTGGCGCCGCACCGGCCCAAGGAGCCCGCGTGGTTCCTGGCCACCGTCGGCGTCTCGCCCGACCACCAGGGCAAGGGTCTGGGCAGCGCCGTCGTGCTCCCCGGAGTGGAGGCGGCCGAGCGCGCYGGGGTGCCCGCCTTCCTGGAGACCTCCGCGCCCCGCAACCTCCCCTTCTACGAGCGGCTCGGCTTCACCGTCACCGCCGACGTCGAGGTGCCCGAAGGACCGCGCACCTGGTGCATGACCCGCAAGCCCGGTGCCGTCGACAATCAACCTCTGGATTACAAAATTTGTGAAAGATTGACTGGTATTCTTAACTATGTTGCTCCTTTTACGCTATGTGGATACGCTGCTTTAATGCCTTTGTATCATGCGTTAACTAACTAaacttgtttattgcagcttataatggttacaaataaagcaatagcatcacaaatttcacaaataaagcatttttttcactgcattctagttgtggtttgtccaaactcatcaatgtatcttatcatgtctggaattgactcaaatgatgtcaattagtctatcagaagctatctggtctcccttccgggggacaagacatccctgtttaatatttaaacagcagtgttcccaaactgggttcttatatcccttgctctggtcaaccaggttgcagggtttcctgtcctcacaggaacgaagtccctaaagaaacagtggcagccaggtttagccccggaattgactggattccttttttagggcccattggtatggctttttccccgtatccccccaggtgtctgcaggctcaaagagcagcgagaagcgttcagaggaaagcgatcccgtgccaccttccccgtgcccgggctgtccccgcacgctgccggctcggggatgcggggggagcgccggaccggagcggagccccgggcggctcgctgctgccccctagcgggggagggacgtaattacatccctgggggctttgggggggggctgtccctgatatctataacaagaaaatatatatataataagttatcacgtaagtagaacatgaaataacaatataattatcgtatgagttaaatcttaaaagtcacgtaaaagataatcatgcgtcattttgactcacgcggtcgttatagttcaaaatcagtgacacttaccgcattgacaagcacgcctcacgggagctccaagcggcgactgagatgtcctaaatgcacagcgacggattcgcgctatttagaaagagagagcaatatttcaagaatgcatgcgtcaattttacgcagactatctttctagggttaatctagctgcatcaggatcatatcgtcgggtcttttttccggctcagtcatcgcccaagctggcgctatctgggcatcggggaggaagaagcccgtgccttttcccgcgaggttgaagcggcatggaaagagtttgccgaggatgactgctgctgcattgacgttgagcgaaaacgcacgtttaccatgatgattcgggaaggtgtggccatgcacgcctttaacggtgaactgttcgttcaggccacctgggataccagttcgtcgcggcttttccggacacagttccggatggtcagcccgaagcgcatcagcaacccgaacaataccggcgacagccggaactgccgtgccggtgtgcagattaatgacagcggtgcggcgctgggatattacgtcagcgaggacgggtatcctggctggatgccgcagaaatggacatggataccccgtgagttacccggcgggcgcgcttggcgtaatcatggtcatagctgtttcctgtgtgaaattgttatccgctcacaattccacacaacatacgagccggaagcataaagtgtaaagcctggggtgcctaatgagtgagctaactcacattaattgcgttgcgctcactgcccgctttccagtcgggaaacctgtcgtgccagctgcattaatgaatcggccaacgcgcggggagaggcggtttgcgtattgggcgctcttccgcttcctcgctcactgactcgctgcgctcggtcgttcggctgcggcgagcggtatcagctcactcaaaggcggtaatacggttatccacagaatcaggggataacgcaggaaagaacatgtgagcaaaaggccagcaaaaggccaggaaccgtaaaaaggccgcgttgctggcgtttttccataggctccgcccccctgacgagcatcacaaaaatcgacgctcaagtcagaggtggcgaaacccgacaggactataaagataccaggcgtttccccctggaagctccctcgtgcgctctcctgttccgaccctgccgcttaccggatacctgtccgcctttctcccttcgggaagcgtggcgctttctcatagctcacgctgtaggtatctcagttcggtgtaggtcgttcgctccaagctgggctgtgtgcacgaaccccccgttcagcccgaccgctgcgccttatccggtaactatcgtcttgagtccaacccggtaagacacgacttatcgccactggcagcagccactggtaacaggattagcagagcgaggtatgtaggcggtgctacagagttcttgaagtggtggcctaactacggctacactagaaggacagtatttggtatctgcgctctgctgaagccagttaccttcggaaaaagagttggtagctcttgatccggcaaacaaaccaccgctggtagcggtggtttttttgtttgcaagcagcagattacgcgcagaaaaaaaggatctcaagaagatcctttgatcttttctacggggtctgacgctcagtggaacgaaaactcacgttaagggattttggtcatgagattatcaaaaaggatcttcacctagatccttttaaattaaaaatgaagttttaaatcaatctaaagtatatatgagtaaacttggtctgacagttaccaatgcttaatcagtgaggcacctatctcagcgatctgtctatttcgttcatccatagttgcctgactccccgtcgtgtagataactacgatacgggagggcttaccatctggccccagtgctgcaatgataccgcgagacccacgctcaccggctccagatttatcagcaataaaccagccagccggaagggccgagcgcagaagtggtcctgcaactttatccgcctccatccagtctattaattgttgccgggaagctagagtaagtagttcgccagttaatagtttgcgcaacgttgttgccattgctacaggcatcgtggtgtcacgctcgtcgtttggtatggcttcattcagctccggttcccaacgatcaaggcgagttacatgatcccccatgttgtgcaaaaaagcggttagctccttcggtcctccgatcgttgtcagaagtaagttggccgcagtgttatcactcatggttatggcagcactgcataattctcttactgtcatgccatccgtaagatgcttttctgtgactggtgagtactcaaccaagtcattctgagaatagtgtatgcggcgaccgagttgctcttgcccggcgtcaatacgggataataccgcgccacatagcagaactttaaaagtgctcatcattggaaaacgttcttcggggcgaaaactctcaaggatcttaccgctgttgagatccagttcgatgtaacccactcgtgcacccaactgatcttcagcatcttttactttcaccagcgtttctgggtgagcaaaaacaggaaggcaaaatgccgcaaaaaagggaataagggcgacacggaaatgttgaatactcat

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**Isolate sequences:**

Isolate 1:

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Isolate 2:

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Isolate 4:

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Isolate 5:

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Isolate 6:

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Isolate 7:

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Isolate 8:

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Isolate 9:

gtaaaattaaattaattataaaattatgtatatgatttactaactttagttagataagttagtaatacataaattttagtatattaatattatattttaaatattttatttagtgtctagaaaaaaatgtgtgaccaacgaccgtaggaaactctagagggtaagaaaaatcaatcgcGctttttcgcaacgggtttgccgccagaacacagctgaagcttcgaggggctcgcatctctccttcacgcgcccgccgccctacctgaggccgccatccacgccggttgagtcgcgttctgccgcctcccgcctgtggtgcctcctgaactgcgtccgccgtctagCTCCTGGGCAACGGTACCGGATCCCTGCAGAAGCTTCTAAAAATTGAAATTTTATTTTTTTTTTTTGGAATATAAATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCTCAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCCGACATCCCCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTGCGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAACAGTACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACGAGCTGTACAAGTCTAGATCTGCCACCATGCTTGCATTTTGTTATTCGTTGCCCAATGCGGGTGATGTAATAAAGGGCAGAGTATACGAGAAGGATTATGCTCTATATATTTATCTTTTTGACTATCCTCACTTTGAAGCTATCTTGGCAGAGAGTGTTAAGATGCATATGGATAGATATGTTGAATATAGGGATAAACTGGTAGGGAAAACTGTAAAAGTTAAAGTGATTAGAGTTGATTATACAAAAGGATATATcGATGTCAATTACAAAAGGATGTGTAGACATCAATAATAgGCGGCCGCCTAaacttgtttattgcagcttataatggttacaaataaagcaatagcatcacaaaAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAAA……aaaaatcaatcgctttatagagaccatcagaaagaggtttaatatttttgtgagaccatcgaaggagaaagagataaaacttttttacgactccatcagaaagaggtttaatatttttgtgagaccatcgaaggagaaagagataaaacttttttacgactccatcagaaagaggtttaatatttttgtgagaccatcgaaggagaaagagataaaacttttttacgactccatcagaaagaggtttaatatttttgtgagaaaggagaaagagataaaacttttttacgactccatcagaaagaggtttaatatttttgtgagaccatcgaaggagaaagagataaaacttttttacgactccatcagaaagaggtttaatatttttgtgagaccatcgaaggagaaagagataaaacttttttacgactccatcagaaagaggtttaatatttttgtgagaccatcgaaggagaaagagataaaacttttttacgactccatcagaaagaggtttaatatttttgt

Isolate 10:

atggatatctttaaagaactaatcgtaaaacaccctgatgaaaatgttttgatttctccagtttctattttatctactttatctattctaaatcatggagcagctggttctacagctgaacaactatcaaaatatatagagaatatgaatgagaatacacccgatgacaataatgacatggacgtagatattccgtattgtgcgacactagctaccgcaaataaaatatacggtagcgatagtatcgagttccacgcctccttcctacaaaaaataaaagacgattttcaaactgtaaactttaataatgctaaccaaacaaaggaactaatcaacgaatgggttaagacaatgacaaatggtaaaattaattccttattgactagtccgctatccattaatactcgtatgacagttgttagcgccgtccattttaaagcaatgtggaaatatccattttctaaacatcttacatatacagacaagttttatatttctaagaatatagttaccagtgttgatatgatggtgggtaccgagaataacttgcaatatgtacatattaatgaattattcggaggattctctattatcgatattccatacgagggaaactctagtatggtgattatactaccggacgacatagaaggtatatataacatagaaaaaaatataacagatgaaaaatttaaaaaatggtgtggtatgttatctactaaaagtatagacttgtatatgccaaagtttaaagtggaaatgacagaaccgtataatctggtaccgattttagaaaatttaggacttactaatatattcggatattatgcagattttagcaagatgtgtaatgaaactatcactgtagaaaaatttctacatacgacgtttatagatgttaatgaggagtatacagaagcatcggccgttacaggagtatttacgattaacttttcgatggtatatcgtacgaaggtctacataaaccatccattcatgtacatgattaaagacaccacaggacgtatactttttatagggaaatactgctatccgcaataaatataaacaaatagacttttatcacgtttatctatgtctaaatattacaaatagtaatagtataaactaaagctgataatacttaaaaaaataataatatcatttacaattaatagtataaactaaaaattaaacaaatcgttattataagtaatatcaaaatgatgatatacggattaatagcgtgtcttatattcgtgacttcatccatcgctagtccacccattacggaagataaatcgttcaatagtgtagaggtattagtttccttgtttagagatgaccaaaaagactatacggtaacttctcagttcaataactacactatcgataccaaagactggactatccacacctgatggtttggatataccattgactaatataacttattggtcacggtttactataggtcgtgcattgttcaaatcagagtctgaggatattttccaaaagaaaatgagtattctaggtgtttctatagaatgtaagaagtcgtcgacattacttacttttttgaccgtgcgtaaaatgactcgagtatttaataaatttccagatatggcttattatcgaggagactgtttaaaagccgtttatgtaacaatgacttataaaaatactaaaactggagagactgattacacgtacctctctaatgggggttgcctgcatactatcgtaatggggtcgatggttgattattgattagtatattcctgctttttcgcaacgggtttgccgccagaacacagctgaagcttcgaggggctcgcatctctccttcacgcgcccgccgccctacctgaggccgccatccacgccggttgagtcgcgttctgccgcctcccgcctgtggtgcctcctgaactgcgtccgccgtctagCTCCTGGGCAACGGTACCGGATCCCTGCAGAAGCTTCTAAAAATTGAAATTTTATTTTTTTTTTTTGGAATATAAATGGTGAGCAAGGGCGAGGAGGATAACATGGCCATCATCAAGGAGTTCATGCGCTTCAAGGTGCACATGGAGGGCTCCGTGAACGGCCACGAGTTCGAGATCGAGGGCGAGGGCGAGGGCCGCCCCTACGAGGGCACCCAGACCGCCAAGCTGAAGGTGACCAAGGGTGGCCCCCTGCCCTTCGCCTGGGACATCCTGTCCCCTCAGTTCATGTACGGCTCCAAGGCCTACGTGAAGCACCCCGCCGACATCCCCGACTACTTGAAGCTGTCCTTCCCCGAGGGCTTCAAGTGGGAGCGCGTGATGAACTTCGAGGACGGCGGCGTGGTGACCGTGACCCAGGACTCCTCCCTGCAGGACGGCGAGTTCATCTACAAGGTGAAGCTGCGCGGCACCAACTTCCCCTCCGACGGCCCCGTAATGCAGAAGAAGACCATGGGCTGGGAGGCCTCCTCCGAGCGGATGTACCCCGAGGACGGCGCCCTGAAGGGCGAGATCAAGCAGAGGCTGAAGCTGAAGGACGGCGGCCACTACGACGCTGAGGTCAAGACCACCTACAAGGCCAAGAAGCCCGTGCAGCTGCCCGGCGCCTACAACGTCAACATCAAGTTGGACATCACCTCCCACAACGAGGACTACACCATCGTGGAACAGTACGAACGCGCCGAGGGCCGCCACTCCACCGGCGGCATGGACGAGCTGTACAAGTCTAGATCTGCCACCATGCTTGCATTTTGTTATTCGTTGCCCAATGCGGGcGATGTAATAAAGGGCAGAGTATACGAGAAGGATTATGCTCTATAcATTTATCTTTTTGACTATCCTCACTcTGAAGCTATCTTGGCAGAGAGTGTTAAGATGCATATGGATAGATATGTTGAATATAGGGATAAACTGGTAGGGAAAACTGTAAAAGTTAAAGTGATTAGAGTTGATTATACAAAAGGATATATAGATGTCAATTACAAAAGGATGTGTAGACATCAATAATAgGCGGCCGCCTAaacttgtttattgcagcttataatggttacaaataaagcaatagcatcacaaaATTCACAAATAAAGCATTTTTTCACTGCAAAAAAAAAAAAAAAAAAAAAAAAAAAaagagtaacagctgcccccattcttaataatcgtcagtatttaaactgttaaatgttggtatatcaacatctaccttatttcccgcagtataaggtttgttgcaggtatactgttcaggaatggttacatttatacttcttctatagtcctgtctttcgatgttcatcacatatgcaaagaacagaataaacaaaataatgtaagaaataatattaaatatctgtgaattcgtaaatacattgattgccataataattacagcagctacaatacacacaatagacattcccacagtgttgccattacctccacgatacatttgagttactaagcaataggtaataactaagctagtaagaggcaatagaaaagatgagataaatatcatcaatatagagattagaggagggctatatagagccaagacgaacaaaatcaaaccgagtaacgttctaacatcattatttttgaagattcccaaataatcattcattcctccataatcgttttgcatcatacctccatctttaggcataaacgattgctgctgttcctctgtaaataaatctttatcaagcactccagcacccgcagagaagtcgtcaagcatattgtaatatcttaaataactcat

Nanopore reads showing K3L-CNV:

Isolate 4: 4231d531-093c-4e3a-bf5f-ca4433a171d4

Isolate 5: e6dc6bc6-1905-411e-9712-db9dba137f55