

Muscle alignment of TgPBAL orthologues

Black shading represents exact match

In red catalytic residues from crystallography DOI: 10.1110/ps.0241803

In green shade if demonstrated essential for protein activity DOI: 10.1021/bi049676n

| | 10 | 20 | 30 | 40 | 50 | 60 | |
|-------------------------|-------------|------------|-------------|------------|------------|---------------|-----|
| ETH_00031750 | | | | | | | 3 |
| Vbra_16581 | ---MNS | | | | | | 43 |
| Cvel_3471 | ---MGGVRTL | YASGGGG | ----- | -VKSLKMRDL | LRRKKERRKI | TVITAYDFIG | 60 |
| SN3_00101300 | MSYVGGPTSS | TSEGGGASSL | CFGNFMSFEP | QLKSLKLEDL | LGRKKAGCKI | TMITAYDYLS | 12 |
| NCLIV_039640 | PETEETSS | ----- | ----- | ----- | ----- | -----HQVP | 5 |
| TGME49_265870 | ---METHT | ----- | ----- | ----- | ----- | ----- | 5 |
| HHA_265870 | ---MDTSD | ----- | ----- | ----- | ----- | ----- | 5 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 1 |
| | 70 | 80 | 90 | 100 | 110 | 120 | |
| ETH_00031750 | | | | | | | 14 |
| Vbra_16581 | AQVANSAMLD | CILVGDSLAN | VVLGHARTNQ | IGMDEMLYHC | KSVTRGNSRC | FVIGDMPFGS | 103 |
| Cvel_3471 | GRIADAAAI | MVLVGDSLGN | VVLGHSRTDK | VTMEDMLHHT | RAVTRGCKRA | FVVGDLPPFGS | 69 |
| SN3_00101300 | SQALRRTETS | LLLLPLGDV | LRLGSPRRVT | RSSASHIHEQ | AYLRRF--- | A SAVLPPFAVS | 26 |
| NCLIV_039640 | ----- | ----- | ---LAQLGRDT | LP----- | -----A | FSAEFLPSSS | 22 |
| TGME49_265870 | ----- | ----- | ---LANVG | -P----- | -----Q | FSVELGTRFA | 22 |
| HHA_265870 | ----- | ----- | ---LANVG | -S----- | -----M | FSVELGTRFA | 11 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | Q LSLVPKPRSD | 11 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | M LSLVPKPRSD | 9 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | M LI IETLPL-- | 8 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | M TIPAFHP-- | |
| | 130 | 140 | 150 | 160 | 170 | 180 | |
| ETH_00031750 | | | | | | | 30 |
| Vbra_16581 | CREVSVHRST | CGRVRE | ----- | ----- | ----- | ----- | 163 |
| Cvel_3471 | YSTVDRAVQN | AIRFVNEGGV | AAVKIEGPMY | EQIKAVSOLT | PVVGHTGVLP | QTAENFLARG | 179 |
| SN3_00101300 | CCTVEKALEN | AHALMRE-GC | HAVKLEGPLL | AQIQAISQFV | PVVAHLGLQP | QTASSFASRG | 109 |
| NCLIV_039640 | SCFPCDAVIC | NTSYST--- | ----- | -----MYST | SATAHHGTGP | WAQENWDAFG | 35 |
| TGME49_265870 | -AFF---PF- | ---RATA | ----- | ----- | ----- | ----- | 34 |
| HHA_265870 | -AKFCVQRL- | ---NWSA | ----- | ----- | ----- | ----- | 34 |
| XP_002768075.P. marinus | -AKFCVQKL- | ---NLSA | ----- | ----- | ----- | ----- | 27 |
| XP_002767048.P. marinus | I SELAAKISA | RIAAKA--- | ----- | ----- | ----- | ----- | 27 |
| sp P31663 PANC_ECOLI | I SELAAKISA | RITAKS--- | ----- | ----- | ----- | ----- | 9 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 8 |
| | 190 | 200 | 210 | 220 | 230 | 240 | |
| ETH_00031750 | | | | | | | 30 |
| Vbra_16581 | KTAKDAQYLV | EAAQALEAAG | CCMIVLEKVC | SEVAEEISR | LTIPTIGIGA | GPHCDGQVLV | 223 |
| Cvel_3471 | RTADEAITLL | EDARAVEAAG | ASFLVLEKVA | AEVAQEITSS | LSIPTIGIGA | GNVTDGQVLV | 239 |
| SN3_00101300 | SGCLPWSRSN | FFFSADCAE | DAPLSTSSYM | SAPSPPEGV | LDACHTKAAE | RPRNVTLGQK | 169 |
| NCLIV_039640 | ----- | ----- | ----- | ---PPRD | R----- | ----- | 41 |
| TGME49_265870 | ----- | ----- | ---NRKIC | R----- | ----- | ----- | 40 |
| HHA_265870 | ----- | ----- | ---NQEIC | R----- | ----- | ----- | 40 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 27 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 27 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 9 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 8 |
| | 250 | 260 | 270 | 280 | 290 | 300 | |
| ETH_00031750 | | | | | | | 49 |
| Vbra_16581 | WHDVLGLQSP | GSLSLKFVRR | FGD---GWR | ASCPIAATP | EQQQQQ--- | ----- | 279 |
| Cvel_3471 | WHDVLGLCPP | GFPKIKFAKT | FGGEPGWGWK | AALHAVEEYA | EAVTRGIFPG | -QPQTFYMG | 298 |
| SN3_00101300 | QHPCAPSQPP | RTP----- | ---RPI | VLIHSPRELL | -AYRNA--- | ----- | 200 |
| NCLIV_039640 | ----- | ----- | ---REI | LVVHSPQELV | -AYRNA--- | ----- | 59 |
| TGME49_265870 | ----- | ----- | ---SSH | VRVLNPRNCP | RNCRNG--- | ----- | 59 |
| HHA_265870 | ----- | ----- | ---SSQ | VRVLNPRNFP | RSHRNG--- | ----- | 59 |
| XP_002768075.P. marinus | ----- | ----- | ---GPP | VVVRVSGDFV | ALHNTD--- | ----- | 46 |
| XP_002767048.P. marinus | ----- | ----- | ---GPP | VVVRVSGDFV | ALHNTD--- | ----- | 46 |
| sp P31663 PANC_ECOLI | ----- | ----- | ---LR | QQIRRL--- | ----- | ----- | 17 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ---GEL | NVYSAPGDVA | DVSRAL--- | ----- | 27 |
| | 310 | 320 | 330 | 340 | 350 | 360 | |

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|-------------------------|---------|-------|-------|-------|-------|-----|
| HHA_265870 | RR----- | ----- | ----- | ----- | ----- | 132 |
| XP_002768075.P. marinus | GL----- | ----- | ----- | ----- | ----- | 51 |
| XP_002767048.P. marinus | GL----- | ----- | ----- | ----- | ----- | 51 |
| sp P31663 PANC_ECOLI | GK----- | ----- | ----- | ----- | ----- | 22 |
| sp P9WIL5 PANC_MYCTU | GR----- | ----- | ----- | ----- | ----- | 32 |

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|-------------------------|------------|------------|------------|------------|------------|------------|-----|
| | 670 | 680 | 690 | 700 | 710 | 720 | |
| ETH_00031750 | | | | | | | 70 |
| Vbra_16581 | NAVVNPLTAL | YGVNNGALTR | PHFEPLISQI | AQEVSEVGRA | RGIRLPEGSN | LVKVVQRAAE | 584 |
| Cvel_3471 | NAAINPLTAL | MGICNGGLET | QPLSTVAAA | AEEVVRVARS | KGVRLSEAS- | VRSALESTIR | 714 |
| SN3_00101300 | ----- | ----- | ----- | ----- | ----- | ----- | 373 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | ----- | ----- | 119 |
| TGME49_265870 | ----- | ----- | ----- | ----- | ----- | ----- | 132 |
| HHA_265870 | ----- | ----- | ----- | ----- | ----- | ----- | 132 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 51 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 51 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 22 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 32 |

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| | 730 | 740 | 750 | 760 | 770 | 780 | |
| ETH_00031750 | | | | | | | 70 |
| Vbra_16581 | TTAANTSSMR | TDVENRLPTE | ISAICGAIAS | EARKVGLSAP | VNEMLVHLIK | A---LEEQRQ | 641 |
| Cvel_3471 | GTARNQSSML | QDVQRGSQSE | VRAICGAVAE | EARRNGVAAP | LCSLLCLMVE | GKCLKQQQPQ | 774 |
| SN3_00101300 | ----- | ----- | ----- | ----- | ----- | ----- | 373 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | ----- | ----- | 119 |
| TGME49_265870 | ----- | ----- | ----- | ----- | ----- | ----- | 132 |
| HHA_265870 | ----- | ----- | ----- | ----- | ----- | ----- | 132 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 51 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 51 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 22 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 32 |

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| | 790 | 800 | 810 | 820 | 830 | 840 | |
| ETH_00031750 | | | | | | | 70 |
| Vbra_16581 | T----- | -----TPPAP | ASPPLPPQPT | AAKETHAALA | PTAAATSPPM | ATRVCKTPSE | 687 |
| Cvel_3471 | RQQQEQHSKS | STYDGSPPAC | VSHPSPPSNG | LQANGHAEYV | SAGAKVSHTA | RTTLVRDPKK | 834 |
| SN3_00101300 | ----- | ----- | ----- | ----- | ----- | ----- | 373 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | ----- | ----- | 119 |
| TGME49_265870 | ----- | ----- | ----- | ----- | ----- | ----- | 132 |
| HHA_265870 | ----- | ----- | ----- | ----- | ----- | ----- | 132 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 51 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 51 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 22 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 32 |

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| | 850 | 860 | 870 | 880 | 890 | 900 | |
| ETH_00031750 | | | | | | | 115 |
| Vbra_16581 | LMGVRSTLPA | SARVAVFVFL | GGLHGDHML | LDEASRR--- | GDRVWTSIFL | NQLQFQSAKD | 744 |
| Cvel_3471 | LTALRKQVPP | SSRVVVFVFL | GGLHEGHLAL | VEDARRRCGE | GGQVWCSEVL | NRLQFQSAQD | 894 |
| SN3_00101300 | ----- | --RISIVPTL | GGLHEGHLHL | MROAACL--- | SDEVVVSIFL | NPLQFQSSKD | 418 |
| NCLIV_039640 | ----- | --RISIVPTM | GGLHEGHLHL | IRGAICT--- | GDEVVVTIEV | NALQFHSAKD | 164 |
| TGME49_265870 | ----- | --RISIVPTM | GGLHEGHLHL | IRGAICT--- | GDEVVVTIEV | NALQFHSAKD | 177 |
| HHA_265870 | ----- | --RISIVPTM | GGLHEGHLHL | IRGAICT--- | GDEVVVTIEV | NALQFHSAKD | 177 |
| XP_002768075.P. marinus | ----- | --SVGFVPTM | GSLHSGHMKL | IATARPN--- | HDVLVVSIEV | NPAQFSPEED | 96 |
| XP_002767048.P. marinus | ----- | --SVGFVPTM | GSLHSGHMKL | IATARPN--- | HDVLVVSIEV | NPAQFSPEED | 96 |
| sp P31663 PANC_ECOLI | ----- | --RVALVPTM | GNLHDGHMKL | VDEAKAR--- | ADVVVVSIEV | NPMQFDRPED | 67 |
| sp P9WIL5 PANC_MYCTU | ----- | --RVMLVPTM | GALHEGHLAL | VRAAKRV--P | GSVVVVSIEV | PMQFGAGED | 78 |

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| | 910 | 920 | 930 | 940 | 950 | 960 | |
| ETH_00031750 | | | | | | | 171 |
| Vbra_16581 | FDTYPIKVEE | DLHLLLTQ-- | TNAQVLELPE | ASEMYPHLAP | RRGAPAGAPG | GGPPVVGAP-- | 783 |
| Cvel_3471 | FDTYPMRLDE | DIAKLRDR-- | N-VEVIFETN | VQDIYP--TA | EDSF----- | ----- | 933 |
| SN3_00101300 | FDTYPMDLQR | DVQMLEEA-- | G-VDVVFAPS | SEGVYS--DK | DAVF----- | ----- | 472 |
| NCLIV_039640 | LLTYPASIDE | DIRLIQQL-- | GVVSVLEVP | REALFP-LDA | PAGF---SAS | PGVTSASASS | 215 |
| TGME49_265870 | FLTYPASIDD | DMKLLSQV-- | R-VDLVFI | HSSLYP-LDS | RPHL---IAG | SEELYTVP-- | 230 |
| HHA_265870 | FLTYPASIDD | DMKLLSQV-- | R-VDLVFI | HSSLYP-LDR | RPHL---IAG | SEVLSTIPAR | 230 |
| XP_002768075.P. marinus | YEQYPRDLEG | DLKKLETESA | G-VDVVFAP | PADMYP-KNP | RAIV----- | ----- | 138 |
| XP_002767048.P. marinus | YEQYPRDLEG | DLKKLETESA | G-VDVVFAP | PADMYP-KNP | RAIV----- | ----- | 138 |
| sp P31663 PANC_ECOLI | LARYPRTLQE | DCEKLNKR-- | K-VDLVFI | VKEIYP-NGT | ETHT----- | ----- | 107 |
| sp P9WIL5 PANC_MYCTU | LDAVPRTPDD | DLAQLRAE-- | G-VEIAFET | TAAMYD-DGL | RTTV----- | ----- | 118 |

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| 970 | 980 | 990 | 1000 | 1010 | 1020 |
|-----|-----|-----|------|------|------|

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| ETH_00031750 | GEGLAPGGRP | TAGGPPVGGAP | AQRRGVPPFAE | ----- | ----- | ----- | 201 |
| Vbra_16581 | ----- | ----- | ----- | ----- | ----- | ----- | 783 |
| Cvel_3471 | ----- | ----- | ----- | ----- | ----- | ----- | 933 |
| SN3_00101300 | EHGIRAGHLT | ACGERKESTS | EEGRETASQD | SETLVSVPPA | AAACHKTAAA | VGDSAGTVTP | 532 |
| NCLIV_039640 | -RGRDNG--- | --DARANGLP | NATD----KE | ADRVVRSVPS | GFKLERLDTH | AGERDA---- | 261 |
| TGME49_265870 | GRGLEDG--- | --GGRVTSQG | SDDEADAMEE | ADRVELSPVD | --RLNRGDAR | AREVDG---- | 279 |
| HHA_265870 | GRGLEDG--- | --GGRVTSQG | SDDEADAMEE | ADRVEVSPVD | --RLNRGDAR | GREVDG---- | 279 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 138 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 138 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 107 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 118 |

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| | 1030 | 1040 | 1050 | 1060 | 1070 | 1080 | |
| ETH_00031750 | ----- | ----- | ----- | ----- | ----- | ----- | 201 |
| Vbra_16581 | ----- | ----- | ----- | ----- | ----- | ----- | 783 |
| Cvel_3471 | ----- | ----- | ----- | ----- | ----- | ----- | 933 |
| SN3_00101300 | SVKLEGSSEL | FLQGNDDGRL | PSKVAATLGS | VVYDKASPAR | SVLTATSTPT | AEESSAHEKG | 592 |
| NCLIV_039640 | ----- | ----- | ----- | ---LGPTPA- | ----ASWIP- | ----- | 272 |
| TGME49_265870 | ----- | ----- | ----- | ---DGCSHS- | ----A-WSP- | ----- | 289 |
| HHA_265870 | ----- | ----- | ----- | ---DDCSHS- | ----A-WSP- | ----- | 289 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 138 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 138 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 107 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 118 |

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| | 1090 | 1100 | 1110 | 1120 | 1130 | 1140 | |
| ETH_00031750 | ----- | ----- | ----- | ----- | ----- | ----- | 224 |
| Vbra_16581 | ----- | ----- | ----- | ----- | ----- | ----- | 823 |
| Cvel_3471 | ----- | ----- | ----- | ----- | ----- | ----- | 973 |
| SN3_00101300 | NSGRRRQOEK | PNSSGSSRLF | RMRVFFKDIE | DVQCEGRRRR | GFFGGIGTVV | AQLLTLTRPT | 652 |
| NCLIV_039640 | ----- | ----PQRLF | RMRVDFEGIE | EVECEGRRRS | GFLRGIGTVV | TQLFTLIRPT | 317 |
| TGME49_265870 | ----- | ----PQRLF | RMRVDFEGIE | DVECEGRRRC | GFFRGIGTVV | QQLFTLIRPT | 334 |
| HHA_265870 | ----- | ----PQRLF | RMRVDFEGIE | DVECEGRRRC | GFFRGIGTVV | VQLFTLIRPT | 334 |
| XP_002768075.P. marinus | ----- | ----- | PSVTVEPNFV | NGLSEAACRP | TFFRGVATVV | MKLFNIIRPE | 178 |
| XP_002767048.P. marinus | ----- | ----- | PSVTVEPNFV | NGLSEAACRP | TFFRGVATVV | MKLFNIIRPE | 178 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----YVDVPGLS | TML-EGASRP | GHFRGVSTIV | SKLFLNVQPD | 144 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----QPGL | AAELEGGPRP | THFAGVLTVV | LKLLQIVRPD | 153 |

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|-------------------------|------------|------------|------------|------------|------------|------------|------|
| | 1150 | 1160 | 1170 | 1180 | 1190 | 1200 | |
| ETH_00031750 | ----- | -----VS | SGCIDTRVVL | CPTARG-PQC | LPFASRNKRL | TQQOLEKAOE | 265 |
| Vbra_16581 | VVVFQKDFL | QTVIVRKLCA | EFFPDVEVAV | VPTVRE-KDC | LAFASRNARL | TPEERKRAPL | 882 |
| Cvel_3471 | VAIFGQKDFL | QTVVVKRLAR | EFFIDTEIVV | HETVRE-ESC | LATASRNEKL | TKEERHKAAG | 1032 |
| SN3_00101300 | YVHVGLKDFQ | QVICLRLVC | GLGLDLVVA | HSTKRHASDC | LSLSRRNKRL | SGAERTAAAK | 712 |
| NCLIV_039640 | YAHFGFKDFQ | QVACVKRLIC | GMGLDALLA | HNTWRD-SDC | MAASSRNRRM | TEEDRKKARK | 376 |
| TGME49_265870 | YAHCGFKDFQ | QVACLKRLIC | GMGLDALLA | HNTWRD-SDC | VAASSRNRRM | AEADRQKARK | 393 |
| HHA_265870 | YAHCGFKDFQ | QVACLKRLIC | GMGLDALLA | HNTWRD-SDC | VAASSRNRRM | AEADRQKARK | 393 |
| XP_002768075.P. marinus | RAYFGQKDM | QVSVIISMVK | DLNVPVELEV | VPTARE-ADC | LASSSRNVYL | TPAMREKATI | 237 |
| XP_002767048.P. marinus | RAYFGQKDM | QVSVIISMVK | DLNVPVELEV | VPTARE-ADC | LASSSRNVYL | TPAMREKATI | 237 |
| sp P31663 PANC_ECOLI | IACFGEKDFQ | QLALIRKVA | DMGFIEIVG | VPIMRA-KDC | LALSSRNRYL | TAEQRKIAPG | 203 |
| sp P9WIL5 PANC_MYCTU | RVFFGEIDYQ | LVLIRQLVA | DFNLDAVAVG | VPTVRE-ADC | LAMSSRNRYL | DPAQRAAAVA | 212 |

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|-------------------------|-------------|------------|------------|------------|------------|-------------|------|
| | 1210 | 1220 | 1230 | 1240 | 1250 | 1260 | |
| ETH_00031750 | ----- | ----- | ----- | ----- | ----- | ----- | 320 |
| Vbra_16581 | ACAVLKEVEA | LYNKGTR-QI | GALRAAA--- | AAAERVG-A | HLEYLAFNRQ | ADGAPIVPLG | 320 |
| Cvel_3471 | IYQTLQAVEA | QHRRGER-DA | GVLTEAG--- | RVFAASHG-L | SVDYITVCDL | YTGKAADVLO | 937 |
| SN3_00101300 | LFASLSLVKD | AVESGEVTSV | SDLISLG--- | LTALKKRE-M | HMDYLILSDL | ESGRELQEDE | 1088 |
| NCLIV_039640 | YYSVLQVQCR | SYERGER-RV | QOLETEA--- | RLHAAAAG-L | HLYYITFNRW | QDGAPVAYTS | 767 |
| TGME49_265870 | SFLLLQHVSR | -----ER- | ----- | ----- | ----- | ----- | 388 |
| HHA_265870 | SFLLLQHVGE | VFRKGER-RV | HRLLEEA--- | RAFAEKEN-L | LLHYTAIDRL | EDGEPPVYRH | 448 |
| XP_002768075.P. marinus | SFLLLQHVGE | VFRKGER-RV | HTLLEEA--- | RAFAEKEN-L | LLHYTAIDRL | EDGEPPVYRH | 448 |
| XP_002767048.P. marinus | LYKSLCAAAYD | MVKSASK-PV | KASEVEDVVK | RTLLAEPMVL | GIEYISVASV | ETAQEVETIQ | 296 |
| sp P31663 PANC_ECOLI | LYKSLCAAAYD | MVKSASK-PV | KASEVEDVVK | RTLLAEPMVL | GIEYISVASV | ETAQEVETIQ | 296 |
| sp P9WIL5 PANC_MYCTU | LYKVISSIAD | KLQAGER-DL | DEIITIA--- | GOELNEKG-F | RADDIQIRDA | D'ILLEVSETS | 258 |
| sp P9WIL5 PANC_MYCTU | LSAALTAAAH | AATAGAQ--- | -AALDAA--- | RAVLDAAPGV | AVDYLELRDI | GLG-PMPLNG | 264 |

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| | 1270 | 1280 | 1290 | 1300 | 1310 | 1320 | |
| ETH_00031750 | ----- | ----- | ----- | ----- | ----- | ----- | 337 |
| Vbra_16581 | APRGAPRR-- | ----- | ----- | ----- | ----- | ----- | 939 |
| Cvel_3471 | PT----- | ----- | ----- | ----- | ----- | ----- | 1096 |
| SN3_00101300 | EVCPGAAL-- | ----- | ----- | ----- | ----- | ----- | 827 |
| NCLIV_039640 | GSSWTRKTPS | CCSATSNTTD | SVAPASCSSL | GANQQEHTRQ | QEQAQQQLA | RRKEDAEAQT | 388 |
| TGME49_265870 | SGGAVKRIET | QGESAEN--- | ----- | --EERRAKRR | RTESDIADET | PLGRPGTGSF | 493 |

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|-------------------------|------------|------------|-------|------------|----------|---------------|-----|
| HHA_265870 | SGGAVKRIDT | HRESAAN--- | ----- | --GERRAKRR | RTDSDIAD | EA QIGRPGTGSP | 493 |
| XP_002768075.P. marinus | FGPEA---- | ----- | ----- | ----- | ----- | ----- | 301 |
| XP_002767048.P. marinus | FGPEA---- | ----- | ----- | ----- | ----- | ----- | 301 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 258 |
| sp P9WIL5 PANC_MYCTU | SGR----- | ----- | ----- | ----- | ----- | ----- | 267 |

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| | 1330 | 1340 | 1350 | 1360 | 1370 | 1380 | |
| ETH_00031750 | PNVDPTGGPT | GAPRRAPCEA | PEGPPQGDEG | SLPEN-DQIC | VAVAIR-MAP | GCSIVDNFVL | 395 |
| Vbra_16581 | ----- | ----- | ----- | -----KSYC | VAIGAS-VGP | SCRLLVDNIVL | 962 |
| Cvel_3471 | ----- | -CLHAGGSVK | VSKP----- | -----V | LLPSGT-PRE | RVRLVDNVVI | 1129 |
| SN3_00101300 | SRLQPEGEAN | HERKVDGCEQ | QQEDKEGVEE | RLLESPGKYC | CTVAVR-GNA | DITLVDNVTL | 886 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | -----R-ANP | ----- | 392 |
| TGME49_265870 | SSYKRGHGLK | GELHANGSSR | SSSPADTADM | ILLDS-GRYC | LTVAVR-GNP | LTTVVDSVFL | 551 |
| HHA_265870 | SSYKRGHGLK | GELHANGSSH | SSSPADTADM | ILLDS-GRYC | LTVAVR-GNP | LTTVVDSVVL | 551 |
| XP_002768075.P. marinus | ----- | ----- | ----- | -----EPVL | VAIAVKYGA | NLRLIDNMWM | 325 |
| XP_002767048.P. marinus | ----- | ----- | ----- | -----EPVL | VAIAVKYGA | NLRLIDNMWM | 325 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | -----KRAV | ILVAAW-LGD | -ARLIDNKMV | 280 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | LLVAAR-LGT | -TRLLDNIAI | 285 |

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|-------------------------|------------|------------|------------|------------|------------|------------|------|
| | 1390 | 1400 | 1410 | 1420 | 1430 | 1440 | |
| ETH_00031750 | SDTHKFGDLL | PPVPNSAEAV | PSAAAALLPL | HAAPCVLLLR | SLSLQLLQKS | PPAAAAA | 455 |
| Vbra_16581 | EAPKG-DSAQ | QRQQQSGWMA | SWLGAGK--- | ----- | ----- | ----- | 988 |
| Cvel_3471 | RVP----- | ----- | ----- | ----- | ----- | ----- | 1132 |
| SN3_00101300 | TDQPQCGDLL | PPPLNVWGR | NSAAAKHSFF | ---GSFLVLA | SLGMHLRYLN | EDVDLLLOA | 943 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | ----- | ----- | 392 |
| TGME49_265870 | IPNNR-EDLL | PPLFNTPWDH | HCVEPKYACL | ---PSFLVFS | SFGFHLRPLR | PSDLKLVAAA | 607 |
| HHA_265870 | IPNNR-EDLL | PPLFNTPWDH | HCVEPKYACL | ---PSFLLFS | SFGFHLRPLR | PSDLKLVVAA | 607 |
| XP_002768075.P. marinus | DNQKHA---- | ----- | ----- | ----- | ----- | ----- | 331 |
| XP_002767048.P. marinus | DNQKHA---- | ----- | ----- | ----- | ----- | ----- | 331 |
| sp P31663 PANC_ECOLI | ELA----- | ----- | ----- | ----- | ----- | ----- | 283 |
| sp P9WIL5 PANC_MYCTU | EIGTFAGTDR | PDGYRAILES | HWRN----- | ----- | ----- | ----- | 309 |

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|-------------------------|------------|------------|------------|------------|-----------|------------|------|
| | 1450 | 1460 | 1470 | 1480 | 1490 | 1500 | |
| ETH_00031750 | AEWAQTVEE- | ----- | ----- | ----- | ----- | ----- | 464 |
| Vbra_16581 | ----- | ----- | ----- | ----- | ----- | ----- | 988 |
| Cvel_3471 | ----- | ----- | ----- | ----- | ----- | ----- | 1132 |
| SN3_00101300 | EEEDMEPRQN | GFRLLLPPLS | PAVGATAACQ | RQTEGEKNLG | CSTRQQPVA | AGPGTETREP | 1003 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | ----- | ----- | 392 |
| TGME49_265870 | EQEDARVES- | ----- | ----- | ----- | ----- | ----- | 616 |
| HHA_265870 | EQEDARVES- | ----- | ----- | ----- | ----- | ----- | 616 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 331 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 331 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 283 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 309 |

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|-------------------------|------------|------------|------------|------------|------------|-------------|------|
| | 1510 | 1520 | 1530 | 1540 | 1550 | 1560 | |
| ETH_00031750 | ----- | ----- | ----- | ----- | -----LE | ALELSDPVVS | 476 |
| Vbra_16581 | ----- | ----- | ----- | ----- | ----- | ----- | 988 |
| Cvel_3471 | ----- | ----- | ----- | ----- | ----- | ----- | 1132 |
| SN3_00101300 | LLQQQORIGV | CEGTRARTGE | RMHILRWLQQ | QRRTLFEVEA | AGTRKTLWMK | KQGD TAAAGA | 1063 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | ----- | ----- | 392 |
| TGME49_265870 | ----- | ----- | ----- | ----- | -----Q | QSAKSAGVAA | 627 |
| HHA_265870 | ----- | ----- | ----- | ----- | -----Q | QSAKSTGADA | 627 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 331 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 331 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 283 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 309 |

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|-------------------------|------------|------------|------------|------------|------------|------------|------|
| | 1570 | 1580 | 1590 | 1600 | 1610 | 1620 | |
| ETH_00031750 | SLSSAERQKA | WPWASAAAA | AAAP----- | ----- | ----- | ----- | 500 |
| Vbra_16581 | ----- | ----- | ----- | ----- | ----- | ----- | 988 |
| Cvel_3471 | ----- | ----- | ----- | ----- | ----- | ----- | 1132 |
| SN3_00101300 | AEQSCVRPCA | QQSSQVHSPA | TSGSGSTFQN | SSNVCRVRAV | GLFKYDLME | CSSSSNETAR | 1123 |
| NCLIV_039640 | ----- | ----- | ----- | ----- | ----- | ----- | 392 |
| TGME49_265870 | PETCCTRTFT | WMHAGALSPT | STHD----- | -----VWAL | GLFKRRL--- | ----- | 662 |
| HHA_265870 | PETCCTRTFT | WMHAGALSPT | STHD----- | -----VWAL | GLFKRRL--- | ----- | 662 |
| XP_002768075.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 331 |
| XP_002767048.P. marinus | ----- | ----- | ----- | ----- | ----- | ----- | 331 |
| sp P31663 PANC_ECOLI | ----- | ----- | ----- | ----- | ----- | ----- | 283 |
| sp P9WIL5 PANC_MYCTU | ----- | ----- | ----- | ----- | ----- | ----- | 309 |

1630 1640 1650 1660 1670 1680

| | | |
|-------------------------|---|------|
| ETH_00031750 | | 500 |
| Vbra_16581 | ----- ----- ----- ----- ----- ----- ----- ----- | 988 |
| Cvel_3471 | ----- ----- ----- ----- ----- ----- ----- ----- | 1132 |
| SN3_00101300 | LTSHCSDRAA LEADRISVAS RGGADASIQS KDTRRREGRH VAAVGDTSAN RTALHSGGRT | 1183 |
| NCLIV_039640 | ----- ----- ----- ----- ----- ----- ----- ----- | 392 |
| TGME49_265870 | ----- ----- ----- ----- ----- ----- ----- ----- | 677 |
| HHA_265870 | ----- ----- ----- ----- ----- ----- ----- ----- | 677 |
| XP_002768075.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | 331 |
| XP_002767048.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | 331 |
| sp P31663 PANC_ECOLI | ----- ----- ----- ----- ----- ----- ----- ----- | 283 |
| sp P9WIL5 PANC_MYCTU | ----- ----- ----- ----- ----- ----- ----- ----- | 309 |

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|-------------------------|--|------|------|------|------|------|------|
| | 1690 | 1700 | 1710 | 1720 | 1730 | 1740 | |
| ETH_00031750 | | | | | | | 518 |
| Vbra_16581 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 988 |
| Cvel_3471 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 1132 |
| SN3_00101300 | PAERDTCLSG AADRCSDSGN PRETTAKSGR FKRRERLIGY VWAEYAGEE QGGPPQKRER | | | | | | 1243 |
| NCLIV_039640 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 392 |
| TGME49_265870 | PDGNEV--- | --- | --- | --- | --- | --- | 693 |
| HHA_265870 | PDGNEV--- | --- | --- | --- | --- | --- | 693 |
| XP_002768075.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| XP_002767048.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| sp P31663 PANC_ECOLI | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 283 |
| sp P9WIL5 PANC_MYCTU | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 309 |

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|-------------------------|---|------|------|------|------|------|------|
| | 1750 | 1760 | 1770 | 1780 | 1790 | 1800 | |
| ETH_00031750 | | | | | | | 578 |
| Vbra_16581 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 988 |
| Cvel_3471 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 1132 |
| SN3_00101300 | KEGCSASGNV CRVLRVNRVF LKRERRRQTL GTHLLRAFIA ATYKOLLEEQ QQAVSVAPRH | | | | | | 1303 |
| NCLIV_039640 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 392 |
| TGME49_265870 | TPRAAAAAGG ASPWRLLRRGF ITRARRRRTF GTHLLKAFLA TLYKEKVSSS RTA----- | | | | | | 746 |
| HHA_265870 | TPRAAAAAGG ASPWRLLRRGF ITRARRRRTF GTHLLKAFLA TLYREKVSSN RTA----- | | | | | | 746 |
| XP_002768075.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| XP_002767048.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| sp P31663 PANC_ECOLI | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 283 |
| sp P9WIL5 PANC_MYCTU | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 309 |

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|-------------------------|---|------|------|------|------|------|------|
| | 1810 | 1820 | 1830 | 1840 | 1850 | 1860 | |
| ETH_00031750 | | | | | | | 578 |
| Vbra_16581 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 988 |
| Cvel_3471 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 1132 |
| SN3_00101300 | HRPPSAPVLH QRQQQEAVLK TAGHTGPTVK GRPQECEDRE AVVCKIRRTE EEQEMQEDAI | | | | | | 1363 |
| NCLIV_039640 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 392 |
| TGME49_265870 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 746 |
| HHA_265870 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 746 |
| XP_002768075.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| XP_002767048.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| sp P31663 PANC_ECOLI | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 283 |
| sp P9WIL5 PANC_MYCTU | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 309 |

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|-------------------------|---|-------|-------|-------|-------|-------|------|
| | 1870 | 1880 | 1890 | 1900 | 1910 | 1920 | |
| ETH_00031750 | | | | | | | 585 |
| Vbra_16581 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 988 |
| Cvel_3471 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 1132 |
| SN3_00101300 | TEATETRKS ERGKLETLCV EGTESTLEG GATEGKEWKK SKHEMEGEIS CTVQLENVPH | | | | | | 1423 |
| NCLIV_039640 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 392 |
| TGME49_265870 | -----SR EV----- | ----- | ----- | ----- | ----- | ----- | 757 |
| HHA_265870 | -----SR EV----- | ----- | ----- | ----- | ----- | ----- | 757 |
| XP_002768075.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| XP_002767048.P. marinus | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 331 |
| sp P31663 PANC_ECOLI | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 283 |
| sp P9WIL5 PANC_MYCTU | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | | 309 |

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|---------------|---|------------|------------|------------|------|------|
| | 1930 | 1940 | 1950 | 1960 | 1970 | |
| ETH_00031750 | | | | | | 638 |
| Vbra_16581 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | 988 |
| Cvel_3471 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | 1132 |
| SN3_00101300 | YLVGVLREGG FCVDTAAAET TRAQTYKGS CCMHVSLAQW YNAFVLNANV --- | | | | | 1473 |
| NCLIV_039640 | ----- ----- ----- ----- ----- ----- ----- ----- | | | | | 392 |
| TGME49_265870 | WLAPAVSECG FSL----- | LDSTNLSSGE | CRLHLNLDKW | FRTYVTDLRL | --- | 800 |

