**Additional file 2**

**Trimmed alignment of opsin sequences**

Parhyale\_Ops2 MSHSH----SPYAVPGGQAPGGPSFGYPPGVSLVDIVPPHIKDLIHPHWS

Parhyale\_Ops1 MAS---WNNPASMLPE--GMVST-NPFG-NFTVVDAAPKDLLPLIDPHWY

Hyalella\_azteca MSHSH----YASASRGALGANDFVFGYAPGVSVVDIVPPHMKDLIHPHWS

SW\_Procambarus\_clarkii MALLDGTNDTNLIRPALFGEGVAAGGRYEMRMLGWNTPSEYMDYVHPYWK

LW-like\_Daphnia\_magna MANLT----GDAVVAMAQKQAFDPWALPDSFTLYAYAPEDIRSFLHPHWH

UV-like\_Daphnia\_magna MLLPNG---NESTGPIAQ------SWKYESRMNGWNTPADYKSYVHPHWL

BLUE-like\_Daphnia\_magna MALNST--------------ASFDAFRSDRRMMGWNTPEDYMSYVHPYWK

494\_Loligo\_forbesi MGRDI-----------------------PDNETWWYNP---YMDIHPHWK

475\_Enteroctopus\_dofleini MVESTT----------------------LVNQTWWYNP---TVDIHPHWA

490\_Calliphora\_erythrocephalaR MERYS---IGPSFAAL------------TNGSVTDKVTPDMAHLVHPYWN

520\_Limulus\_polyphemus MANQL-------------SYSSLGWPYQPNASVVDTMPKEMLYMIHEHWY

530\_L\_polyphemus MANQL-------------SYSSLGWPYQPNASVVDTMPKEMLYMIHEHWY

420\_D\_melanogasterRh2 MERSHTAHSGPRFQAQSS----------GNGSVLDNVLPDMAHLVNPYWS

345\_D\_melanogasterRh3 MESGNSGNVSTALRPEA-------RLSAETRLLGWNVPPEELRHIPEHWL

533\_Procambarus\_clarkii MSS---WSNQPAMDDY--GLPSS-NPYG-NFTVVDMAPKDILHMIHPHWY

515\_Sphodromanti\_ssp MS----LINEPSYSAY--SWGGQ-GGYG-NQTVVDKVLPEMLHLIDPHWY

480\_Todarodes\_pacificus MGRDL-----------------------RDNETWWYNP---SIVVHPHWR

Gallus\_gallus\_pinealOpsin MSSNS-----------------------QAPPNGTPGPFD-----GPQWP

499\_Loligo\_subulata ------------------------------NETWWYNP---YMDIHSHWK

480\_Hemigrapsus\_sanguineus MANVT----GPQMAFY--GSGAATFGYPEGMTVADFVPDRVKHMVLDHWY

529\_Apis\_mellifera M-I---AVSGPSYEAF--SYGGQ-ARFN-NQTVVDKVPPDMLHLIDANWY

510\_Cataglyphis\_bombycinus MS----IASGPSHAAY--TWTAQGGGFG-NQTVVDKVPPEMLHLVDAHWY

510\_Camponotus\_abdominalis MS----IASGPSHAAY--TWASQGGGFG-NQTVVDKVPPEMLHMVDAHWY

520\_Schistocerca\_gregaria MASAS-LISEPSFSAY---WGGS-GGFA-NQTVVDKVPPEMLYLVDPHWY

430\_S\_gregaria MVNTT--DFYPVPAAMAY------ESSVGLPLLGWNVPTEHLDLVHPHWR

437\_D\_melanogasterRh5 MHI------NGPSGPQAY--VNDSLGDGSVFPMGHGYPAEYQHMVHAHWR

508\_Drosophila\_melanogasterRh6 MAS---LH-PPSFAYM---------RDGRNLSLAESVPAEIMHMVDPYWY

492\_Sepia\_officinalis MGRDI-----------------------PDNETWWYNP---TMEVHPHWK

529\_Cambarus\_ludovicianus -----------------------------------------LHMIHLHWY

526\_Cambarellus\_shufeldtii -----------------------------------------LHMIHLHWY

530\_Orconectes\_virilis -----------------------------------------LHMIHLHWY

522\_Procambarus\_milleri -----------------------------------------LHMIHLHWY

360\_C\_bombycinus MYT------NRSVHWEA-----RILPAGPPRLLGWNVPAEELVHIPEHWL

360\_C\_abdominalis MY-------NGSFHWEA-----RILPAGPPRLLGWNVPAEELVHIPEHXL

439\_A\_mellifera MLLHNTGKALAFIAEEGY------VPSMREKFLGWNVPPEYSDLVHPHWR

353\_A\_mellifera MS-------NDSIHWEA-----RYLPAGPPRLLGWNVPAEELIHIPEHWL

520\_Papilio\_xuthusRh1 MAMDS-LD--PGAASAP-AWAGKIEAYGSNHTVIDQVLPEMLHLIDPHWY

520\_P\_xuthusRh2 MAIAN-LE--PGMGASE-AWGGQAAAFGSNQTVVDKVTPDMMHLIDPHWY

575\_P\_xuthusRh3 MALNY-LN--TGAAKMD-TWNGQMSAYGANQTVVDKVLPEMLHLIDPHWY

450\_M\_sexta MATNF-TQELYEIGPMAY-PLKMISKDVAEHMLGWNIPEEHQDLVHDHWR

520\_Manduca\_sexta ------MDPGPGLAALQ-AWAAKSPAYGANQTVVDKVPPDMMHMIDPHWY

357\_M\_sexta MNNQS-ENYYHGAQFEAL------KSAGAIEMLGDGLTGDDLAAIPEHWL

460\_P\_xuthusRh4 MAANY----SDDIGPMAY-PMKLVSSEMVEHMMGWNIPEEHQAMVHAHWR

P\_xuthus\_Rh5 MDNHT-ENNYNYGAYFAP------YRLEGVELLGAGLTGEDLAAIPEHWL

570\_Heliconius\_erato -------------------------------------------------H

550\_Heliconius\_sara -------------------------------------------------H

510\_Galleria\_mellonella -------------------------------------------------Y

515\_Spodoptera\_exigua -------------------------------------------------Y

510\_Junonia\_coenia -------------------------------------------------Y

560\_Bicyclus\_anynana --------------------------------------------------

493\_Loligo\_pealii MGRDI-----------------------PDNETWWYNP---YMEINSHWK

529\_Bombus\_terrestris -------------------------------------------------Y

553\_Osmia\_rufa -------------------------------------------------Y

540\_Pieris\_rapae MAITN-LDPAPGVAAMQ-SFGIHAEAFGSNQTVIDKVLPEMMHLIDPHWY

489\_Neogonodactylus\_oerstediiR MSY---WNSNKIVEEY--SLPST-NPYG-NFTVVDTVPENMLHMIHSHWY

528\_N\_oerstediiRh2 MSY---YDDSASAAYT--------NPYG-NHTVVDTVPADMLHLIDSHWY

522\_N\_oerstediiRh3 MSY---WNSNKAMEEY--SLPST-NPYG-NFTVVDTVPENMLHMVHSHWY

496\_Archaeomysis\_grebnitzkii --------------------------------------------------

487\_Euphausia\_superba --------------------------------------------------

512\_Holmesimysis\_costata --------------------------------------------------

515\_Homarus\_gammarus --------------------------------------------------

501\_Mysis\_diluviana --------------------------------------------------

520\_Neomysis\_americana --------------------------------------------------

530\_Vanessa\_cardui MAITS-LD--PGAAALQ-AWGGQMAAFGSNETVVDKVLPDMLHLVDPHWY

Homo\_sapiens\_GPR52 MNE-------------------------------------------SRWT

Homo\_sapiens\_MTNR1A MQGN------------------------GSALPNASQPVLRGDGARPSW-

Anolis\_carolinensis\_pinealOpsi M------------------------------LNGTPGPFE-----GPQWP

478\_D\_melanogasterRh1 MESFA-AQLGPHFAPL------------SNGSVVDKVTPDMAHLISPYWN

375\_D\_melanogasterRh4 MEPLC-NASEPPLRPEA-----RSSGNGDLQFLGWNVPPDQIQYIPEHWL

Bostaurus\_rhodopsin MNGTEN----------------------SNKTGVVRSPFE-----APQY-

Parhyale\_Ops2 NFPPVNPMWHYLLGVIYIILGSLAIFGNGVVIYLFLKVKRLRMPSNLLVV

Parhyale\_Ops1 QYPPMNPLWYGLLGFTIFILGILSIVGNAVVIWVFMNTKSLRSPANLLVV

Hyalella\_azteca SFPPPNPMWHYLLGIIYIVMGVLATFGNGVVIYLYMKIKKLRTPSNLLVL

SW\_Procambarus\_clarkii TFQAPNPFLHYMLAVLYIMFMFAALVGNGVVIWVFTSAKNLRTPSNMFII

LW-like\_Daphnia\_magna TYKALHPAWYYFLGLMYLVIGTCAVAGNAVVLKIFSRFPALRSPANLLVM

UV-like\_Daphnia\_magna SYEEPNPMLHHLLGVLYIFFMIASCLGNGIVIYIFSTTKELKTPSNILIL

BLUE-like\_Daphnia\_magna TFEAPNPFLHYTLGFFYIIFMFCALMGNGVVIWIFTSCKSLRTPSNMLVV

494\_Loligo\_forbesi QFDQVPAAVYYSLGIFIAICGIIGCVGNGVVIYLFTKTKSLQTPANMFII

475\_Enteroctopus\_dofleini KFDPIPDAVYYSVGIFIGVVGIIGILGNGVVIYLFSKTKSLQTPANMFII

490\_Calliphora\_erythrocephalaR QFPAMEPKWAKFLAAYMVLIATISWCGNGVVIYIFSTTKSLRTPANLLVI

520\_Limulus\_polyphemus AFPPMNPLWYSILGVAMIILGIICVLGNGMVIYLMMTTKSLRTPTNLLVV

530\_L\_polyphemus AFPPMNPLWYSILGVAMIILGIICVLGNGMVIYLMMTTKSLRTPTNLLVV

420\_D\_melanogasterRh2 RFAPMDPMMSKILGLFTLAIMIISCCGNGVVVYIFGGTKSLRTPANLLVL

345\_D\_melanogasterRh3 TYPEPPESMNYLLGTLYIFFTLMSMLGNGLVIWVFSAAKSLRTPSNILVI

533\_Procambarus\_clarkii QYPPMNPMMYPLLLIFMLFTGILCLAGNFVTIWVFMNTKSLRTPANLLVV

515\_Sphodromanti\_ssp QFPPMNPLWHGLLGFVIGCLGFVSVVGNGMVIYIFSTTKGLRTPSNLLVV

480\_Todarodes\_pacificus EFDQVPDAVYYSLGIFIGICGIIGCGGNGIVIYLFTKTKSLQTPANMFII

Gallus\_gallus\_pinealOpsin --YQAPQSTYVGVAVLMGTVVACASVVNGLVIVVSICYKKLRSPLNYILV

499\_Loligo\_subulata QFDQVPAAVYYSLGIFIAICGIIGCAGNGIVIYLFTKTKSLQTPANMFII

480\_Hemigrapsus\_sanguineus NYPPVNPMWHYLLGVVYLFLGVISIAGNGLVIYLYMKSQALKTPANMLIV

529\_Apis\_mellifera QYPPLNPMWHGILGFVIGMLGFVSAMGNGMVVYIFLSTKSLRTPSNLFVI

510\_Cataglyphis\_bombycinus QFPPMNPLWHAILGFVIGILGMISVIGNGMVIYIFTTTKSLRTPSNLLVI

510\_Camponotus\_abdominalis QFPPMNPLWHALLGFVIGVLGVISVIGNGMVIYIFTTTKSLRTPSNLLVV

520\_Schistocerca\_gregaria QFPPMNPLWHGLLGFVIGVLGVISVIGNGMVIYIFSTTKSLRTPSNLLVV

430\_S\_gregaria SFQVPNKYWHFGLAFVYFMLMCMSSLGNGIVLWIYATTKSIRTPSNMFIV

437\_D\_melanogasterRh5 GFREAPIYYHAGFYIAFIVLMLSSIFGNGLVIWIFSTSKSLRTPSNLLIL

508\_Drosophila\_melanogasterRh6 QWPPLEPMWFGIIGFVIAILGTMSLAGNFIVMYIFTSSKGLRTPSNMFVV

492\_Sepia\_officinalis QFNQVPDAVYYSLGIFIGICGIIGCTGNGIVIYLFTKTKSLQTPANMFII

529\_Cambarus\_ludovicianus QYPPMNPMMYPLLLVFMLITGILCLAGNFVTIWVFMNTKSLRTPANLLVV

526\_Cambarellus\_shufeldtii QYPPMNPMMYPLLLIFMFITGIPCLAGNFVTIWVFMTTKSLRSPANLLVV

530\_Orconectes\_virilis QYPPMNPMMYPLLLIFMLFTGILCLAGNFVTIWVFMNTKSLRTPANLLVV

522\_Procambarus\_milleri QYPPMNPMMYPLLLIFMLFTGILCLAGNFVTIWVFMNTKSLRTPANLLVV

360\_C\_bombycinus VYPEPNPSLHYLLAILYTLFTFVALLGNGLVIWIFISAKSLRTPSNMFVV

360\_C\_abdominalis VYPEPNPSLHYLLAIVYILFTFVALFGNGLVIWIFCSAKSLRTPSNLFVV

439\_A\_mellifera AFPAPGKHFHIGLAIIYSMLLIMSLVGNCCVIWIFSTSKSLRTPSNMFIV

353\_A\_mellifera VYPEPNPSLHYLLALLYILFTFLALLGNGLVIWIFCAAKSLRTPSNMFVV

520\_Papilio\_xuthusRh1 QFPPMNPLWHGLLGFVIAVLGFISLSGNGMVIYIFTTTKTLKTPSNLLVL

520\_P\_xuthusRh2 QFPPMNPMWHGLLGFTIGVLGFISITGNGMVVYIFTSTKSLKTPSNLLVV

575\_P\_xuthusRh3 QFPPMNPLWYGLLGFTITCLAITSITGNAMVIYIFTTTKNLKTPSNLLVV

450\_M\_sexta NFPAVSKYWHYVLALIYTMLMVTSLTGNGIVIWIFSTSKSLRSASNMFVI

520\_Manduca\_sexta QFPPMNPLWHALLGFTIGVLGFVSISGNGMVIYIFMSTKSLKTPSNLLVV

357\_M\_sexta SYPAPPASAHTALALLYIFFTFAALVGNGMVIFIFSTTKSLRTSSNFLVL

460\_P\_xuthusRh4 SFPAVSKYYHFILALIYTMLMVTSLVGNGIVIWIFSTSKSLRSASSMFVI

P\_xuthus\_Rh5 SYPAPPASAHTMLALVYVFFTAAALIGNGLVIFIFSASKSLRTPSNLLVV

570\_Heliconius\_erato QFPPMNPLWHGLLGFVIGVLGFISVTGNGMVVYIFTTTKTLKTPSNILVV

550\_Heliconius\_sara QFPPMNPLWHGLLGFVIGVLGFISVTGNGMVVYIFTTTKSLKTPSNILVV

510\_Galleria\_mellonella QFPPMNPLWHGLLGFTIGVLGFISITGNGMVIYIFSSTKTLKTPSNLLVV

515\_Spodoptera\_exigua QFPPMNPLWHGLLGFTIGVLGFISITGNGMVIYIFMSTKSLKTPSNLLVV

510\_Junonia\_coenia QFPPMNPMWHGLLGFFMAVIGFISIAGNGMVVYIFTTTKSLKTPSNILVV

560\_Bicyclus\_anynana --------------------------------------------------

493\_Loligo\_pealii QFDQVPAAVYYSLGIFIGICGIIGCVGNGIVIYLFTKTKSLQTPANMFII

529\_Bombus\_terrestris QFPPLNPMWHGILGFVIGLLGFISVSGNGMVVYIFLSTKSLRTPSNMFVI

553\_Osmia\_rufa QYPPLNPLWHAILGLVIGILGFISVSGNGMVVYIFLSTKSLRTPSNLFVI

540\_Pieris\_rapae QFPPLNPLWHALLGFTISVLAFISITGNGMVVYIFTTTKSLKTPSNLLVV

489\_Neogonodactylus\_oerstediiR QFPPLNPMWYGILAFVVTVVGLCSICGNFVVIWVFMNTKALRSPANTLVV

528\_N\_oerstediiRh2 GFPPLNDMWYGILAFFISVTGILAVGGNFVVIWVFKCTKALRSPLNYYVV

522\_N\_oerstediiRh3 QFPPLNPMWYGILAFVVTVVGLCSICGNFVVIWVIMNTKALRSPANTLVV

496\_Archaeomysis\_grebnitzkii ----MNPLWYGLLGFVIFCLGILSVCGNAVVIWVFMNTKSLRSPANLLVV

487\_Euphausia\_superba ----MNPLWYGLLGFVIFCLGCLSVFGNSVVIWVFTSTKTLRSPANMLVV

512\_Holmesimysis\_costata ----MNPLWYGLLGFWMTVMGTLSVAGNFVVIWVFMNTKSLRTPANLLVV

515\_Homarus\_gammarus ----MNPLWYGLLALWMFVMGTLSVCGNSIVIWVFMNTKALRTPANLLVV

501\_Mysis\_diluviana ----MKSRWYIILGLIISVLAILSVIGNLTVIVVFINTRSLRSPSNLLIV

520\_Neomysis\_americana ----MNPLWYSLVGFWMVIMGVLSVVGNFVVLWVFMTTKSLRTPANLLVV

530\_Vanessa\_cardui QFPPMNPLWHGLLGFVIGILGFISITGNGMVIYIFTTTKSLKTPSNILVV

Homo\_sapiens\_GPR52 EWRILNGFGHYSVTVVIVLLTFLIIAGNLTVIFVFHCAPLLHYTTSYFIQ

Homo\_sapiens\_MTNR1A --------LASALACVLIFTIVVDILGNLLVILSVYRNKKLRNAGNIFVV

Anolis\_carolinensis\_pinealOpsi --FLAPRGTYTSVAVLMGLVVVLATVVNGLVIVVSVRYKRLRSPLNYILV

478\_D\_melanogasterRh1 QFPAMDPIWAKILTAYMIMIGMISWCGNGVVIYIFATTKSLRTPANLLVI

375\_D\_melanogasterRh4 TQLEPPASMHYMLGVFYIFLFCASTVGNGMVIWIFSTSKSLRTPSNMFVL

Bostaurus\_rhodopsin --YLAEPWQFSMLAAYMFLLIMLGFPINFLTLYVTVQHKKLRTPLNYILL

Parhyale\_Ops2 NLAIMDMLMLLSQFPFFVWNCFNGVWMFSPFMCELYACFGSVSGLGSLWT

Parhyale\_Ops1 NLAVSDFLMMLTMFPPMVVSCYYHTWAFSPFFCELYGFFGSIFGCISIWT

Hyalella\_azteca NLAIMDMLMLLSQFPFFVYNCFHGVWAFSPFMCELYACFGAISGLGSLWT

SW\_Procambarus\_clarkii NLAILDFIMML-KTPVFIVNSFNEGPIWGKLGCDTFALMGSYSGVGGAVT

LW-like\_Daphnia\_magna NLAVSDFLLMLALFPECVYNFFLGPWRFGEMGCQIHAFLGACFGYNQIFT

UV-like\_Daphnia\_magna NLAICDFIMMI-KTPVFIVNSFNEGPVFGRLGCSIYGLLGAYVGPCSAVT

BLUE-like\_Daphnia\_magna NLAILDFIMMM-KTPIFIMNSYNEGPIWGKLGCDVFALLGSYNGIGSAMN

494\_Loligo\_forbesi NLAFSDFTFSLNGFPLMTISCFMKYWVFGNAACKVYGLIGGIFGLMSIMT

475\_Enteroctopus\_dofleini NLAMSDLSFSANGFPLKTISAFMKKWIFGKVACQLYGLLGGIFGFMSINT

490\_Calliphora\_erythrocephalaR NLAISDFGIMITNTPMMGINLFYETWVLGPLMCDIYGGLGSAFGCSSILS

520\_Limulus\_polyphemus NLAFSDFCMMAFMMPTMTSNCFAETWILGPFMCEVYGMAGSLFGCASIWS

530\_L\_polyphemus NLAFSDFCMMAFMMPTMASNCFAETWILGPFMCEVYGMAGSLFGCASIWS

420\_D\_melanogasterRh2 NLAFSDFCMMASQSPVMIINFYYETWVLGPLWCDIYAGCGSLFGCVSIWS

345\_D\_melanogasterRh3 NLAFCDFMMMV-KTPIFIYNSFHQGYALGHLGCQIFGIIGSYTGIAAGAT

533\_Procambarus\_clarkii NLAMSDFLMMFTMFPPMMVTCYYHTWTLGPTFCQVYAFLGNLCGCASIWT

515\_Sphodromanti\_ssp NLAFSDFLMMLSMSPPMVINCYYETWVLGPFMCELYALLGSLFGCGSIWT

480\_Todarodes\_pacificus NLAFSDFTFSLNGFPLMTISCFLKKWIFGFAACKVYGFIGGIFGFMSIMT

Gallus\_gallus\_pinealOpsin NLAVADLLVTLCGSSVSLSNNINGFFVFGRRMCELEGFMVSLTGIVGLWS

499\_Loligo\_subulata NLAFSDFTFSLNGFPMMTISCFLKHWVFGQAACKVYGLIGGIFGLTSIMT

480\_Hemigrapsus\_sanguineus NLALSDLIMLTTNFPPFCYNCFSGRWMFSGTYCEIYAALGAITGVCSIWT

529\_Apis\_mellifera NLAISNFLMMFCMSPPMVINCYYETWVLGPLFCQIYAMLGSLFGCGSIWT

510\_Cataglyphis\_bombycinus NLAISDFLMMLSMSPAMVINCYYETWVLGPLVCELYGLTGSLFGCGSIWT

510\_Camponotus\_abdominalis NLAISDFLMMLCMSPAMVINCYYETWVLGPLFCELYGLAGSLFGCASIWT

520\_Schistocerca\_gregaria NLAFSDFLMMFTMSAPMGINCYYETWVLGPFMCELYALFGSLFGCGSIWT

430\_S\_gregaria NLALFDVLMLL-EMPMLVVSSFYQRPVGWELGCDIYAALGSVAGIGSAIN

437\_D\_melanogasterRh5 NLAIFDLFMCT-NMPHYLINATVGYIVGGDLGCDIYALNGGISGMGASIT

508\_Drosophila\_melanogasterRh6 NLAFSDFMMMFTMFPPVVLNGFYGTWIMGPFLCELYGMFGSLFGCVSIWS

492\_Sepia\_officinalis NLAFSDFTFSLNGFPLMTISCFIKKWVFGMAACKVYGFIGGIFGLMSIMT

529\_Cambarus\_ludovicianus NLAMSDFLMMFTMFPPMMITCYYHTWTLGATFCEVYAFLGNLCGCASIWT

526\_Cambarellus\_shufeldtii NLAMSDFLMMFTMFPPMMITCYYHTWTLGPTFCQVYAFLGNLFGCTSIWT

530\_Orconectes\_virilis NLAMSDFLMMFTMFPPMMVTCYYHTWTLGPTFCQVYAFLGNLCGCASIWT

522\_Procambarus\_milleri NLAMSDFLMMFTMFPPMMVTCYYHTWTLGPTFCQVYGFLGNLCGCASIWT

360\_C\_bombycinus NLAFCDFIMML-KAPIFIYNSFNTGFATGHLGCQIFACMGALSGIGASMT

360\_C\_abdominalis NLAFCDFMMML-KAPIFIYNSFHTGFATGHLGCQIFACMGSLSGIGAGMT

439\_A\_mellifera SLAIFDIIMAF-EMPMLVISSFMERMIGWEIGCDVYSVFGSISGMGQAMT

353\_A\_mellifera NLAICDFFMMI-KTPIFIYNSFNTGFALGNLGCQIFAVIGSLTGIGAAIT

520\_Papilio\_xuthusRh1 NLAVSDFLMMTCMAPPLVVNSYHETWVFGPLACALYAAAGSLFGTISIWT

520\_P\_xuthusRh2 NLAFSDFLMMLCMAPPMLINCYYETWVFGPLACELYACAGSLFGSISIWT

575\_P\_xuthusRh3 NLAVSDFLMMACMAPPLIINSYNETWVFGPLFCAIYACGGSLYGTVSIWT

450\_M\_sexta NLAVFDLMMML-EMPLLIMNSFYQRLVGYQLGCDVYAVLGSLSGIGGAIT

520\_Manduca\_sexta NLAFSDFLMMCAMSPAMVVNCYYETWVWGPFACELYACAGSLFGCASIWT

357\_M\_sexta NLAILDFIMMA-KAPIFIYNSAMRGFAVGTVGCQIFALMGAYSGIGAGMT

460\_P\_xuthusRh4 NLAVFDLMMMI-EMPLLIANSFYQHPIGFQLGCDVYAVLGSISGIGGAIT

P\_xuthus\_Rh5 QLAVLDFLMML-KAPIFIYNSIKRGFASGVIGCQIFAFMGSVSGTAAGLT

570\_Heliconius\_erato NLAFSDFLMMFMMAPPMVINCYNETWVFGPLACQLYACAGSLYGCVSIWT

550\_Heliconius\_sara NLAFSDFLMMFMMAPPMVINCYNETWVFGPLACQLYACAGSLYGCVSIWT

510\_Galleria\_mellonella NLAFSDFLMMCAMSPAMVVNCYYETWVFGPFACELYGCAGSLFGCTSIWT

515\_Spodoptera\_exigua NLAFSDFLMMCCMSPAMVVNCYNETWVWGPLACELYACAGSLFGCASIWT

510\_Junonia\_coenia NLAFSDFLMMTVMSPPMVVSCYYETWVFGPLACQLYACAGSLCGCASIWT

560\_Bicyclus\_anynana --ALFDFLMMLVXSPPMVVNCYNETWVFGPLACQLYACAGSLFGCTSIWT

493\_Loligo\_pealii NLAFSDFTFSLNGFPLMTISCFLKYWVFGNAACKVYGLIGGIFGLMSIMT

529\_Bombus\_terrestris NLAISDFLMMFCMSPPMVINCYYETWVLGPLFCQVYAMLGSLFGCGSIWT

553\_Osmia\_rufa NLAISDFLMMFCMSPPMIINCYFETWVFGPLFCQIYAMLGSLFGCSSIWT

540\_Pieris\_rapae NLAFSDFLMMAMMAPPLVVNSYNETWVFGPTACQFYACFGSLFGCVSIWT

489\_Neogonodactylus\_oerstediiR SLAVSDFIMMACMFPPLVLNCYWGTWIFGPLFCEVYAFIGNTVGCASIGN

528\_N\_oerstediiRh2 NLAISDFTLMACMCPPVVINSYYRTWIFGPTFCYVYAAIGSLTGCASIFT

522\_N\_oerstediiRh3 SLAVSDYIMMTCMFPPLVLNCYWGTWIFGPLFCEVYAFIGNTVGCASIGN

496\_Archaeomysis\_grebnitzkii NLAFSDFLMMLNMFPPMVHSCYHGTWMLGAFFCEFYGFTGSLFGCISIWT

487\_Euphausia\_superba NLALSDFLMMANMSPPTVHSCYHGTWMLGPTYCEYYALVGSLSGCISIWT

512\_Holmesimysis\_costata NLAISDFFMMLTMTPPLLANAYWGTWILGAFFCEVYAFLGSFFGCVSIWS

515\_Homarus\_gammarus NLAISDFLMMFCMCPPLLINCYYQTWVWGAFACEVYGCIGSTVGTCSIFC

501\_Mysis\_diluviana NLAFSDFFMMCNMCPAMLLACIYKTWLLGPTYCAWYAFSGSLFGCLSIWT

520\_Neomysis\_americana NLALSDFLMMFTMFPPMVISCYWQTWTLGAFFCEVYAFLGSLFGCVSIWS

530\_Vanessa\_cardui NLAFSDFLMMCVMSPPMVVNCYTETWVFGPLACQLYACAGSLFGCASIWT

Homo\_sapiens\_GPR52 TMAYADLFVGVCLVPTLSLL-HYSTGVHESLTCQVFGYIISVLKSVSMAC

Homo\_sapiens\_MTNR1A SLAVADLVVAIYPYPLVLMSIFNNGWNLGYLHCQVSGFLMGLSVIGSIFN

Anolis\_carolinensis\_pinealOpsi NLAVADLLVTSFGSTISFANNIYGFFVFGPTACEFEGFMVSLTGIVGLWS

478\_D\_melanogasterRh1 NLAISDFGIMITNTPMMGINLYFETWVLGPMMCDIYAGLGSAFGCSSIWS

375\_D\_melanogasterRh4 NLAVFDLIMCL-KAPIF--NSFHRGFALGNTWCQIFASIGSYSGIGAGMT

Bostaurus\_rhodopsin NLAVADLFMVFGGFTTTLYTSLHGYFVFGPTGCNLEGFFATLGGEIALWS

Parhyale\_Ops2 LVFISYDRYNVIVHGVGG-KPLTFTKAALFLLFVWSYAIAISLPPFFG-W

Parhyale\_Ops1 MIFITLDRYNVIVKGVSA-EPLTSKGALLRIMFVWVVSTVWTILPFFG-W

Hyalella\_azteca LVFISYDRYNVIVKGVGG-KPLSFGKAMMCLVFVWGYATAISLPPFFG-W

SW\_Procambarus\_clarkii NAAIAYDRYKTIAKPFEA--KISRGTALMMVVGIWAYASPWALLPLFNIW

LW-like\_Daphnia\_magna LTMISYDRYNVIVKGFSG-TPLTFNRAVTIITMSWIWALGWSICPLVG-W

UV-like\_Daphnia\_magna NAAIAYDRYRCISDPMGK--RWSKSQASLIVLGCWVYASPVSLLPFTELV

BLUE-like\_Daphnia\_magna NAAIAYDRHRTIARPLDG--KLTRKQVTLMIVAIWAWATPFSILPFFGIW

494\_Loligo\_forbesi MTMISIDRYNVIGRPMSASKKMSHRKAFIMIIFVWIWSTIWAIGPIFG-W

475\_Enteroctopus\_dofleini MAMISIDRYNVIGRPMAASKKMSHRRAFLMIIFVWMWSIVWSVGPVFN-W

490\_Calliphora\_erythrocephalaR MCMISLDRYNVIVKGMAG-QPMTIKLAIMKIALIWFMASIWTLAPVFG-W

520\_Limulus\_polyphemus MVMITLDRYNVIVRGMAA-APLTHKKATLLLLFVWIWSGGWTILPFFG-W

530\_L\_polyphemus MVMITLDRYNVIVRGMAA-APLTHKKATLLLLFVWIWSGGWTILPFFG-W

420\_D\_melanogasterRh2 MCMIAFDRYNVIVKGING-TPMTIKTSIMKILFIWMMAVFWTVMPLIG-W

345\_D\_melanogasterRh3 NAFIAYDRFNVITRPMEG--KMTHGKAIAMIIFIYMYATPWVVACYTETW

533\_Procambarus\_clarkii MVFITFDRYNVIVKGVAG-EPLSTKKASLWILTIWVLSITWCIAPFFG-W

515\_Sphodromanti\_ssp MVMIALDRYNVIVKGLAA-KPMTNKTAMLRILGIWAMSIAWTVFPLFG-W

480\_Todarodes\_pacificus MAMISIDRYNVIGRPMAASKKMSHRRAFIMIIFVWLWSVLWAIGPIFG-W

Gallus\_gallus\_pinealOpsin LAILALERYVVVCRPLGD-FQFQRRHAVSGCAFTWGWALLWSTPPLLG-W

499\_Loligo\_subulata MTMISIDRYNVIRRPMSASKKMSHRKAFIMIVFVWIWSTIWAIGPIFG-W

480\_Hemigrapsus\_sanguineus LCMISFDRYNIICNGFNG-PKLTQGKATFMCGLAWVISVGWSLPPFFG-W

529\_Apis\_mellifera MTMIAFDRYNVIVKGLSG-KPLSINGALIRIIAIWLFSLGWTIAPMFG-W

510\_Cataglyphis\_bombycinus MTMIAFDRYNVIVKGLSA-KPMTINGALLRILGIWFFSLGWTIAPMFG-W

510\_Camponotus\_abdominalis MTMIAFDRYNVIVKGLSA-KPMTINGALIRILTIWFFTLAWTIAPMFG-W

520\_Schistocerca\_gregaria MTMIALDRYNVIVKGLSA-KPMTNKTAMLRILFIWAFSVAWTIMPLFG-W

430\_S\_gregaria NAAIAFDRYRTISCPIDG--RLTQGQVLALIAGTWVWTLPFTLMPLLRIW

437\_D\_melanogasterRh5 NAFIAFDRYKTISNPIDG--RLSYGQIVLLILFTWLWATPFSVLPLFQIW

508\_Drosophila\_melanogasterRh6 MTLIAYDRYCVIVKGMAR-KPLTATAAVLRLMVVWTICGAWALMPLFG-W

492\_Sepia\_officinalis MSMISIDRYNVIGRPMAASKKMSHRRAFLMIIFVWMWSTLWSIGPIFG-W

529\_Cambarus\_ludovicianus MVFITFDRYNVIVKGVAG-EPLSTKKASLWILTVWVLSFTWCVAPFFG-W

526\_Cambarellus\_shufeldtii MVFITFDRYNVIVKGVAG-EPLSNKKAALWILSAWVLSFSWCSAPFFG-W

530\_Orconectes\_virilis MVFITFDRYNVIVKGVAG-EPLSNKKAAMWILSVWVLSTAWCMAPFFG-W

522\_Procambarus\_milleri MVFITFDRYNVIVKGVAG-EPLSTKKASLWILIVWVLSLAWCMAPFFG-W

360\_C\_bombycinus NAAIAYDRYSTIARPLDG--KLSRGQVILLIALIWTYTIPWALMPLMHVW

360\_C\_abdominalis NAAIAYDRYSTIARPLDG--KLSRGQVLLLIMLIWTYTIPWALMPLMQVW

439\_A\_mellifera NAAIAFDRYRTISCPIDG--RLNSKQAAVIIAFTWFWVTPFTVLPLLKVW

353\_A\_mellifera NAAIAYDRYSTIARPLDG--KLSRGQVILFIVLIWTYTIPWALMPVMGVW

520\_Papilio\_xuthusRh1 MTMIAFDRYNVIVKGIAA-KPMTNNGALLRILAIWVSSLAWTVAPMFG-W

520\_P\_xuthusRh2 MTMIAFDRYNVIVKGIAA-KPMTINGALLRILGIWLFSLAWTIAPMLG-W

575\_P\_xuthusRh3 MTAIAFDRYNVIVKGIAA-KPMSINGALLRILAIWLSSLAWTVAPIFG-W

450\_M\_sexta NAVIAFDRYKTISSPLDG--RINTVQAGLLIAFTWFWALPFTILPAFRIW

520\_Manduca\_sexta MTMIAFDRYNVIVKGIAA-KPMTSNGALLRILGIWVFSLAWTLLPFFG-W

357\_M\_sexta NACIAYDRHSTITRPLDG--RLSEGKVLLMVAFVWIYSTPWALLPLLKIW

460\_P\_xuthusRh4 NAVIAFDRYKTISCPLDG--RINKVQASLLIAFTWFWSMPFTILPALKVW

P\_xuthus\_Rh5 NACIAYDRHSTITRPLDG--RLSRGKVLLMMVCVWLYTAPWAILPQLQIW

570\_Heliconius\_erato MTMIAFDRYNVIVKGIAA-KPMTINGALLRVFGIWAFSLAWTIAPLFG-W

550\_Heliconius\_sara MTMIAFDRYNVIVKGIAA-KPMTINGALLRVFGIWAFSLAWTIAPLFG-W

510\_Galleria\_mellonella MTMIAFDRYNVIVKGIAA-KPMTNNGALLRILGIWAFSLAWTLAPFFG-W

515\_Spodoptera\_exigua MTMIAFDRYNVIVKGIAA-KPMTNNGALLRILGIWAFSLAWTLAPFFG-W

510\_Junonia\_coenia MTMIAFDRYNVIVKGIAA-KPMTINGALLRVFGIWMFALAWTLAPMFG-W

560\_Bicyclus\_anynana MTMIAFDRYNVIVKGIAG-KPLTINGALLRVFAIWLFSLAWTIAPLFG-W

493\_Loligo\_pealii MTMISIDRYNVIGRPMSASKKMSHRKAFIMIIFVWIWSTTWAIGPIFG-W

529\_Bombus\_terrestris MTMIAFDRYNVIVKGLSG-KPLTINGALLRILGIWLFSLIWTIAPMFG-W

553\_Osmia\_rufa MTAIAFDRYNVIVKGLSG-RPLTINGALLRLLGIWLFSLIWTVAPVLG-W

540\_Pieris\_rapae MTAIAFDRYNVIVKGIAA-KPMTINSALLRILGVWLFSLAWTLAPIFG-W

489\_Neogonodactylus\_oerstediiR MIFITFDRYNVIVKGISG-TPLSQKNTTLQVLFVWICSIMWCVFPFFG-W

528\_N\_oerstediiRh2 MCLISYDRYNVIVKGIGG-KPSPPARQMLIILLVWLFKPPGTFAPFFG-W

522\_N\_oerstediiRh3 MIFITFDRYNVIVKGVSG-KPLSQKNATLQVLFVWICSIMWCVFPFFG-W

496\_Archaeomysis\_grebnitzkii MVFITMDRYNVIVKGVAA-EPLTSKGASIRILFVWTVAFAWTILPFFG-W

487\_Euphausia\_superba MVWITLDRYNVIVKGVAA-TPLTNKGAFARNIFSWLSALIWCVSPLYG-W

512\_Holmesimysis\_costata MVFITADRYNVIVKGVSA-EPLTSGGAMMRIAGTWAFTLAWCLPPFFG-W

515\_Homarus\_gammarus MVFITMDRYNVIVKGVSA-TPLTTNGAMLRNLFSWVTSIGWCLPPFFG-F

501\_Mysis\_diluviana MVWITLERYNVIVKGVSS-KPLSVKGAITRIVLTWIFAVIWCSFPLVG-W

520\_Neomysis\_americana MVWITLDRYNVIVKGVSG-EPLTNSGAMTRIAGTWVTAFAWCLPPFFG-W

530\_Vanessa\_cardui MTMIAFDRYNVIVKGIAA-KPLTINGAMLRVLGIWVFSLAWTVAPLFG-W

Homo\_sapiens\_GPR52 LACISVDRYLAITKPLSYNQLVTPCRLRICIILIWIYSCLIFLPSFFG-W

Homo\_sapiens\_MTNR1A ITGIAINRYCYICHSLKYDKLYSSKNSLCYVLLIWLLTLA-AVLPNLR-A

Anolis\_carolinensis\_pinealOpsi LAILAFERYLVICKPVGD-FRFQQRHAVIGCAFTWLWSLLWTLPPLFG-W

478\_D\_melanogasterRh1 MCMISLDRYQVIVKGMAG-RPMTIPLALGKM-------------------

375\_D\_melanogasterRh4 NAAIGYDRYNVITKPMNR--NMTFTKAVIMNIIIWLYCTPWVVLPLTQFW

Bostaurus\_rhodopsin LVVLAIERYVVVCKPMSN-FRFGENHAIMGVAFTWVMALACAAPPLVG-W

Parhyale\_Ops2 GRYIPEGILDSCSFDYLSRPWSIRSHGVFLFVCCYCVPLCTILYSYIFIV

Parhyale\_Ops1 NRYVPEGNMTACGTDYLSESAFSKSYLYIYGSWVYMLPLIIIIVAYSQIV

Hyalella\_azteca GRYIPEGILDSCSFDYLSRDWSIRSHGVFLFFFCYCVPLSTILYSYVYIV

SW\_Procambarus\_clarkii GRFVPEGFLTTCTFDYMSEDASTRAFVGSIFVFAYIVPGSLVFYFYGQIF

LW-like\_Daphnia\_magna GAYAMDGIMGTCSYDYVSQNMNNKSHILAATFANYILPIIIIAGCYYFIV

UV-like\_Daphnia\_magna NRFVPEGYLTSCTFDYMADNLETKIFVFLLWIWCWIMPLGVIIFSYGKIT

BLUE-like\_Daphnia\_magna GRFVPEGFLTTCTFDYMTEDSSTRFFVGTIFFYSYIIPLALLIFYYSKIV

494\_Loligo\_forbesi GAYTLEGVLCNCSFDYITRDTTTRSNILCMYIFAFMCPIVVIFFCYFNIV

475\_Enteroctopus\_dofleini GAYVPEGILTSCSFDYLSTDPSTRSFILCMYFCGFMLPIIIIAFCYFNIV

490\_Calliphora\_erythrocephalaR SRYVPEGNLTSCGIDYLERDWNPRSYLIFYSIFVYYLPLFLICYSYWFII

520\_Limulus\_polyphemus SRYVPEGNLTSCTVDYLTKDWSSASYVVIYGLAVYFLPLITMIYCYFFIV

530\_L\_polyphemus SRYVPEGNLTSCTVDYLTKDWSSASYVIIYGLAVYFLPLITMIYCYFFIV

420\_D\_melanogasterRh2 SAYVPEGNLTACSIDYMTRMWNPRSYLITYSLFVYYTPLFLICYSYWFII

345\_D\_melanogasterRh3 GRFVPEGYLTSCTFDYLTDNFDTRLFVACIFFFSFVCPTTMITYYYSQIV

533\_Procambarus\_clarkii NRYVPEGNLTGCGTDYLSEDILSRSYLYDYSTWVYYLPL-LPIYCYVSII

515\_Sphodromanti\_ssp NRYVPEGNMTACGTDYLNKEWVSRSYILVYSVFVYFLPLATIIYSYWFIV

480\_Todarodes\_pacificus GAYTLEGVLCNCSFDYISRDSTTRSNILCMFILGFFGPILIIFFCYFNIV

Gallus\_gallus\_pinealOpsin SSYVPEGLRTSCGPNWYTGGSNNNSYILSLFVTCFVLPLSLILFSYTNLL

499\_Loligo\_subulata GAYQLEGVLCNCSFDYITRDASTRSNIVCMYIFAFMFPIVVIFFCYFNIV

480\_Hemigrapsus\_sanguineus GSYTLEGILDSCSYDYFTRDMNTITYNICIFIFDFFLPASVIVFSYVFIV

529\_Apis\_mellifera NRYVPEGNMTACGTDYFNRGLLSASYLVCYGIWVYFVPLFLIIYSYWFII

510\_Cataglyphis\_bombycinus NRYVPEGNMTACGTDYLTKDLLSRSYILVYSFFCYFLPLFLIIYSYFFII

510\_Camponotus\_abdominalis NRYVPEGNMTACGTDYLTKDLFSRSYILIYSIFVYFTPLFLIIYSYFFII

520\_Schistocerca\_gregaria NRYVPEGNMTACGTDYLTKDWVSRSYILVYSFFVYLLPLGTIIYSYFFIL

430\_S\_gregaria SRFTAEGFLTTCSFDYLTDDEDTKVFVGCIFAWSYAFPLCLICCFYYRLI

437\_D\_melanogasterRh5 GRYQPEGFLTTCSFDYLTNTDENRLFVRTIFVWSYVIPMTMILVSYYKLF

508\_Drosophila\_melanogasterRh6 NRYVPEGNMTACGTDYFAKDWWNRSYIIVYSLWVYLTPLLTIIFSYWHIM

492\_Sepia\_officinalis GAYVLEGVLCNCSFDYITRDSATRSNIVCMYIFAFCFPILIIFFCYFNIV

529\_Cambarus\_ludovicianus NRYVPEGNLTGCGTDYLSEDILSRSYLYIYSTWVYFLPLAITIYCYVFII

526\_Cambarellus\_shufeldtii NRYVPEGNLTGCGTDYLSEDALSRSYLYVYSVWVYFLPLLITIYCYVFII

530\_Orconectes\_virilis NSYVPEGNLTGCGTDYLSEDILSRSYLYIYSTWVYFLPLTITIYCYVFII

522\_Procambarus\_milleri NRYVPEGNLTGCGTDYLSEDILSRSYLYIYSTWVYFLPLTITIYCYVFII

360\_C\_bombycinus GRFVPEGFLTSCTFDYLTDTPEIRYFVATIFTFSYCIPMSLIIYYYSQIV

360\_C\_abdominalis GRFVPEGFLTSCSFDYLTDSQEIRYFVPTIFTFSYCVPMLLIIYYYSQIV

439\_A\_mellifera GRYTTEGFLTTCSFDFLTDDEDTKVFVTCIFIWAYVIPLIFIILFYSRLL

353\_A\_mellifera GRFVPEGFLTSCSFDYLTDTNEIRIFVATIFTFSYCIPMILIIYYYSQIV

520\_Papilio\_xuthusRh1 NRYVPEGNMTACGTDYLNKDWFSRSYIVAYAIFCYFTPLALIIYSYFFII

520\_P\_xuthusRh2 NRYVPEGNMTACGTDYLSKSWLSRSYILVYSIFVYYTPLLLIIYSYFFIV

575\_P\_xuthusRh3 NRYVPEGNMTVCGTDYLSKDWLSRSYIIAYAVFCYFLPLGLIVYSYWFII

450\_M\_sexta GRFVPEGFLTTCSFDYFTEDQDTEVFVACIFVWSYCIPMALICYFYSQLF

520\_Manduca\_sexta NRYVPEGNMTACGTDYLSKSWVSRSYILIYSVFVYFLPLLLIIYSYFFIV

357\_M\_sexta GRYVPEGYLTSCSFDYLTNTFDTKLFVACIFTCSYVFPMSLIIYFYSGIV

460\_P\_xuthusRh4 GRFVPEGFLTTCSFDYFTDDQDTKVFVACIFVWSYAIPMALICYFYSQLF

P\_xuthus\_Rh5 GRYVPEGFLTSCTFDYLTTTFDNKLFVASMFVCVYIFPMIAILYFYSGIV

570\_Heliconius\_erato GRYVPEGNMTACGTDYFDQSFSNRSYILLYSIACYYAPLFLIIYSYFFIV

550\_Heliconius\_sara GRYVPEGNMTACGTDYFDQSFSNRSYILLYSIACYYAPLFLIIYSYFFIV

510\_Galleria\_mellonella NRYVPEGNMTACGTDYLNKEWLSRSYILIYSVFVYFTPLLLIIYSYFFIA

515\_Spodoptera\_exigua NRYVPEGNMTACGTDYLSKDWFSRSYILIYSVFVYFMPLLLIIYSYFFIV

510\_Junonia\_coenia GRYVPEGNMTACGTDYFDKTWFNRSYILIYSLFCYFSPLFLIIYSYFFIV

560\_Bicyclus\_anynana GRYVPEGNMTACGTDYFDKSWQNRSYILFYSIFCYYSPLLLICYSYFFII

493\_Loligo\_pealii GAYSLEGVLCNCSFDYISRDSSTRSNIVCMYLFAFMCPIIVIFFCYFNIV

529\_Bombus\_terrestris NRYVPEGNMTACGTDYFSKDIVSVSYILLYSIWVYFFPLFLIIWSYWFIX

553\_Osmia\_rufa NRYVPEGNMTACGTDYFTKDFSSISYIVMYSIWVYLLPLFLIIWSYWFII

540\_Pieris\_rapae SRYVPEGNMTACGTDYLSKDWASRSYIILYAIACYFLPLFLIVYSYWFIV

489\_Neogonodactylus\_oerstediiR NRYVPRGDMTACGTDYLTEDEFSRSYLYVYSVWVYIGPLALIIYCYFHIV

528\_N\_oerstediiRh2 SRYVPEGNMTACGTDYLRGSILDQTYLWSYTTWCYFMTFVFIVYCYWFIV

522\_N\_oerstediiRh3 NRYVPEGNMTACGTDYLTEDEFSRSYLYIYSVWVYIGPLALIIYCYFHIV

496\_Archaeomysis\_grebnitzkii NRYVPEGNLTACGTDYLTEDSTSHLYLYMYASWAYYTPLLYIIYAYTFIV

487\_Euphausia\_superba NRYVPEGNMTACGTDYLTDDWLSHSYLYAYTFWVYLFPFFIIVYCYTYIV

512\_Holmesimysis\_costata NRYVPEGNMLACGTDYLTETELSRSYLYVYSVWVYLFPLAYIIYSYTFIV

515\_Homarus\_gammarus NAYVPEGNLIACGTDYLKESVPYHVYLYLYSVWCYFLPLVIIVYCYTYIV

501\_Mysis\_diluviana NRYVPEGNLTACGTDYLSDDIYSQSYIYLYSVMVYFIPLGITIYCYSYIV

520\_Neomysis\_americana NRYVPEGNMTACGTDYLTDDKFSHSYLYIYSVWVYIFPLFLNIYLYTFII

530\_Vanessa\_cardui GRYVPEGNMTACGTDYLDKSWFNRSYILIYSIFCYFSPLFLIIYSYFFIV

Homo\_sapiens\_GPR52 GKPGYHGDIFECATSWLT-----SAYFTGFIVCLLYAPAAVVCFTYFHIF

Homo\_sapiens\_MTNR1A GTLQYDPRIYSCTF----AQSVSSAYTIAVVVFHFLVPMIIVIFCYLRIW

Anolis\_carolinensis\_pinealOpsi SSYIPEGLRTSCGPNWYTGGNDNNSYIMTLFVTCFITPLAMIIFSYANLL

478\_D\_melanogasterRh1 --YVPEGNLTSCGIDYLERDWNPRSYLIFYSIFVYYIPLFLICYSYWFII

375\_D\_melanogasterRh4 DRFVPEGYLTSCSFDYLSDNFDTRLFVGTIFFFSFVCPTLMILYYYSQIV

Bostaurus\_rhodopsin SRYIPEGMQCSCGIDYYTEETNNESFVIYMFVVHFIIPLIVIFFCYGQLV

Parhyale\_Ops2 KAIVSHEKAMRAQAKKMNVTNLRSGKDDGGQSAEMRVAKVACINVTLWLI

Parhyale\_Ops1 SAVFAHEKQMREQAKKMGVKSLRSEEA-QKTSAECRLAKVALMTVSLWFI

Hyalella\_azteca KAIISHEKAMREQAKKMNVTNLRSGKDDGGQSAEMRVAKVACINVTLWLV

SW\_Procambarus\_clarkii VHVRAHEQAMREQAKKMNVANLRSSHEDQEKSVEIRIAKVCMGLFFLFLI

LW-like\_Daphnia\_magna HAVFKHEEELRAQAKKMNVASLRSNNDQQQVSAEIRIAKVSIMNVSMWLT

UV-like\_Daphnia\_magna TQVMTHEARLKEQAKKMNVETLRSGANKDVRN-EIRVAKVGISLTTLFLL

BLUE-like\_Daphnia\_magna QSVGDHEKTLRDQAKKMNVTSLRSNRDQNEKSAEVRIAKVAIALATLFVV

494\_Loligo\_forbesi MSVSNHEKEMAAMAKRLNAKELRKAQ--AGANAEMKLAKISIVIVTQFLL

475\_Enteroctopus\_dofleini MSVSNHEKEMAAMAKRLNAKELRKAQ--AGASAEMKLAKISMVIITQFML

490\_Calliphora\_erythrocephalaR AAVSAHEKAMREQAKKMNVKSLRSSED-ADKSAEGKLAKVALVTISLWFM

520\_Limulus\_polyphemus HAVAEHEKQLREQAKKMNVASLRAADQ-QKQSAECRLAKVAMMTVGLWFM

530\_L\_polyphemus HAVAEHEKQLREQAKKMNVASLRAADQ-QKQSAECRLAKVAMMTVGLWFM

420\_D\_melanogasterRh2 AAVAAHEKAMREQAKKMNVKSLRSSED-CDKSAEGKLAKVALTTISLWFM

345\_D\_melanogasterRh3 GHVFSHEKALRDQAKKMNVESLRSNVDKNKETAEIRIAKAAITICFLFFC

533\_Procambarus\_clarkii KAVAAHEKGMRDQAKKMGIKSLRNEEA-QKTSAECRLAKIAMTTVALWFI

515\_Sphodromanti\_ssp QAVSAHEKQMREQAKKMNVASLRSAEN-ANTSAECKLAKVALMTISLWFF

480\_Todarodes\_pacificus MSVSNHEKEMAAMAKRLNAKELRKAQ--AGANAEMRLAKISIVIVSQFLL

Gallus\_gallus\_pinealOpsin LTLRAAAAQQKEAD--------------TTQRAEREVTRMVIVMVMAFLL

499\_Loligo\_subulata MSVSNHEKEMAAMAKRLNAKELRKAQ--AGASAEMKLAKISIVIVTQSLL

480\_Hemigrapsus\_sanguineus KAIFAHEAAMRAQAKKMNVTNLRSNEA-ETQRAEIRIAKTALVNVSLWFI

529\_Apis\_mellifera QAVAAHEKNMREQAKKMNVASLRSSEN-QNTSAECKLAKVALMTISLWFM

510\_Cataglyphis\_bombycinus QAVAAHEKNMREQAKKMNVASLRSAEN-QSTSAECKLAKVALMTISLWFM

510\_Camponotus\_abdominalis QAVAAHEKNMREQAKKMNVASLRSAEN-QSTSAECKLAKVALMTISLWFM

520\_Schistocerca\_gregaria QAVSAHEKQMREQRKKMNVASLRSAEA-SQTSAECKLAKVALMTISLWFF

430\_S\_gregaria GAVREHEKMLRDQAKKMNVKSLQSNADTEAQSAEIRIAKVALTIFFLFLC

437\_D\_melanogasterRh5 THVRVHEKMLAEQAKKMNVKSLSANANADNMSVELRIAKAALIIYMLFIL

508\_Drosophila\_melanogasterRh6 KAVAAHEKAMREQAKKMNVASLRNSEA-DKSKAEIKLAKVALTTISLWFF

492\_Sepia\_officinalis MAVSNHEKEMAAMAKRLNAKELRKAQ--AGASAEMKLAKISIVIVTQFLL

529\_Cambarus\_ludovicianus KAVAAHEKGMRDQAKKMGIKSLRNEEA-QKTSAECRLAKIAMTTVALWFI

526\_Cambarellus\_shufeldtii KAVAAHEKGMRDQAKKMGIKSLRNEEA-QKTSAECRLAKIAMTTVALWFI

530\_Orconectes\_virilis KAVAAHEKGMRDQAKKMGIKSLRNEEA-QKTSAECRLAKIAMTTVALWFI

522\_Procambarus\_milleri KAVAAHEKGMRDQAKKMGIKSLRNEEA-QKTSAECRLAKIAMTTVALWFI

360\_C\_bombycinus SHVVNHEKALREQAKKMNVESLRSNTNTNAQSAEIRIAKAAITICFLFVL

360\_C\_abdominalis GHVVSHEKALREQAKKMNVESLRSNVNTNAQSAEIRIAKAAITICFLFVL

439\_A\_mellifera SSIRNHEKMLREQAKKMNVKSLVSNQD-KERSAEVRIAKVAFTIFFLFLL

353\_A\_mellifera SHVVNHEKALREQAKKMNVDSLRSNANTSSQSAEIRIAKAAITICFLYVL

520\_Papilio\_xuthusRh1 QAVAAHEKAMREQAKKMNVASLRSSEA-ANTSAECKLAKVALMTISLWFM

520\_P\_xuthusRh2 QAVAAHEKAMREQAKKMNVASLRSSEA-ANTSAECKLAKVALMTISLWFM

575\_P\_xuthusRh3 QAVAAHEKAMREQAKKMNVASLRSSDA-ANTSAECKLAKVALMTISLWFM

450\_M\_sexta GAVRLHERMLQEQAKKMNVKSLASNKEDNSRSVEIRIAKVAFTIFFLFIC

520\_Manduca\_sexta QAVAAHEKAMREQAKKMNVASLRSSEA-ANTSAECKLAKVALMTISLWFM

357\_M\_sexta KQVFAHEAALREQAKKMNVESLRANQGGSSESAEIRIAKAALTVCFLFVA

460\_P\_xuthusRh4 GAVRLHERMLQEQAKKMNVKSLASNKEDASKSVEIRIAKVAFTIFFMFVC

P\_xuthus\_Rh5 KQVFAHEAALREQAKKMNVDSLRSNQNAAAESAEIRIAKAALTVCFLYVA

570\_Heliconius\_erato QAVAAHEKAMREQAKKMNVASLRSSDA-ANTSAECKLAKVALMTISLWFM

550\_Heliconius\_sara QAVAAHEKAMREQAKKMNVASLRSSDA-ANTSAECKLAKVALMTISLWFM

510\_Galleria\_mellonella QAVAAHEKAMREQAKKMNVASLRSSEA-ANTSAECKLAKVALMTISLWFM

515\_Spodoptera\_exigua QAVAAHEKGMREQAKKMNVASLRSSEA-ANTSAECKLAKVALMTISLWFM

510\_Junonia\_coenia QAVAAHEKAMREQAKKMNVASLRSSDA-ANTSAECKLAKVALMTISLWFM

560\_Bicyclus\_anynana QAVAAHEKAMREQAKKMNVASLRSSEN-ANTSAECKLAKVALMTISLWFM

493\_Loligo\_pealii MSVANHXKEMAAMAKRLNGKELRRAQ--AGASAEMKLGKISVVIVTQFLL

529\_Bombus\_terrestris QAVAAHEKNMREQAKKMNVASLRSSEN-QNTSAECKLAKVALMTISLWFM

553\_Osmia\_rufa QAVAAHEKNMREQAKKMNVASLRSSEN-QNTSAECKLAKVALMTISLWFM

540\_Pieris\_rapae QAVAAHERAMREQAKKMNVASLRSSEQ-ANTSAECKLAKVALMTISLWFM

489\_Neogonodactylus\_oerstediiR SAVATHEKQMRDQAKKMGVKSLRTEEA-KKTSAECRLAKVALTTVSLWFM

528\_N\_oerstediiRh2 AAVRNHEKAMREQAKKMGVKSLRGDATLQKKSADCKLAKIALINVSLWFM

522\_N\_oerstediiRh3 SAVATHEKQMRDQAKKMGVKSLRTEEA-KKTSAGCRLAKVALTTVSLWFM

496\_Archaeomysis\_grebnitzkii QAVSAHEKGMREQAKKMGVKSLRNEEA-QKTSAECRLAKVALMTVSLWFM

487\_Euphausia\_superba SAVFAHEKGMRDQAKKMGVKSLRNEEA-QKTSAECRLAKVALVTVSLWFI

512\_Holmesimysis\_costata KAVAAHEKGMREQAKKMGVKSLRSEEA-QKTSAECRLCKVALMTVTLWFM

515\_Homarus\_gammarus AAVSAHERQMREQAKKMGVKSLRSEES-KKTSNECRLAKVALTTVSLWFI

501\_Mysis\_diluviana HAVANHEKSMKEQAKKMGVKSFRNEET-QRTSAEFRLAKIALMTVSLWFI

520\_Neomysis\_americana KAVANHEKQMREQAKKMGVKSLRSEES-QKTSAECRLAKVALMTVSLWFM

530\_Vanessa\_cardui QAVAAHEKAMREQAKKMNVASLRSSDA-ANTSAECKLAKVALMTISLWFM

Homo\_sapiens\_GPR52 KICRQHTKEINDRRARFPSHEVDSSRE-TGHSPDRRYAMVLFRITSVFYM

Homo\_sapiens\_MTNR1A ILVLQVRQRVKPDRKKLKPQ-------------DFRNFVTMFVVFVLFAI

Anolis\_carolinensis\_pinealOpsi LTLRAVAAQQKEMA--------------TTQQAEREVTRMVVTMVMAFLV

478\_D\_melanogasterRh1 AAVSAHEKAMREQAKKMNVKSLRSSED-AEKSAEGKLAKVALVTITLWFM

375\_D\_melanogasterRh4 GHVFSHEKALREQAKKMNVESLRSNVDKSKETAEIRIAKAAITICFLFFV

Bostaurus\_rhodopsin FTVKEAAAQQQESA--------------TTQKAEKEVTRMVIIMVIAFLI

Parhyale\_Ops2 CWTPYAAIVLQGLFFDQSTITPLVSMLPALLAKSTACYNPMVYALSHPRF

Parhyale\_Ops1 AWTPYLVINFTGMNNK-SVISPLFTIWGSLFAKANAVYNPIVYAISHPKY

Hyalella\_azteca CWTPYAAIVLQGLFFDQSSITPLVSMLPALLCKTTACYNPMVYALSHPRF

SW\_Procambarus\_clarkii SWTPYAVVALIAAFGDRSKLTPLVSMIPALTCKFVACVDPWVYAINHPRY

LW-like\_Daphnia\_magna AWTPFAVICILGTWGDVSKITPLVSAIPVILAKTSCAYNPLIYAISHPKY

UV-like\_Daphnia\_magna SWTPYFMIAFIGCYGNRALLTPGLSMIPACTCKLAACVDPFVYAINHPKY

BLUE-like\_Daphnia\_magna AWTPYAFVALTAAFGNRGVLTPLMSMIPACCCKGVACINPWVYAINHPRY

494\_Loligo\_forbesi SWSPYAVVALLAQFGPIEWVTPYAAQLPVMFAKASAIHNPMIYSVSHPKF

475\_Enteroctopus\_dofleini SWSPYAIIALLAQFGPAEWVTPYAAELPVLFAKASAIHNPIVYSVSHPKF

490\_Calliphora\_erythrocephalaR AWTPYTIINTLGLFKY-EGLTPLNTIWGACFAKSAACYNPIVYGISHPKY

520\_Limulus\_polyphemus AWTPYLIISWAGVFSSGTRLTPLATIWGSVFAKANSCYNPIVYGISHPRY

530\_L\_polyphemus AWTPYLIIAWAGVFSSGTRLTPLATIWGSVFAKANSCYNPIVYGISHPRY

420\_D\_melanogasterRh2 AWTPYLVICYFGLFKI-DGLTPLTTIWGATFAKTSAVYNPIVYGISHPKY

345\_D\_melanogasterRh3 SWTPYGVMSLIGAFGDKTLLTPGATMIPACACKMVACIDPFVYAISHPRY

533\_Procambarus\_clarkii AWTPYLLINWVGMFAR-SYLSPVYTIWGYVFAKANAVYNPIVYAISHPKY

515\_Sphodromanti\_ssp AWTPYLVTDFSGIFEW-GKISPLATIWCSLFAKANAVYNPIVYGISHPKY

480\_Todarodes\_pacificus SWSPYAVVALLAQFGPLEWVTPYAAQLPVMFAKASAIHNPMIYSVSHPKF

Gallus\_gallus\_pinealOpsin CWLPYSTFALVVATHKGIIIQPVLASLPSYFSKTATVYNPIIYVFMNKQF

499\_Loligo\_subulata SWSPYAIVALLAQFGPIEWVTPYAAQLPVMFAKASAIHNPMIYSVSHPKF

480\_Hemigrapsus\_sanguineus CWTPYAAITIQGLLGNAEGITPLLTTLPALLAKSCSCYNPFVYAISHPKF

529\_Apis\_mellifera AWTPYLVINFSGIFNL-VKISPLFTIWGSLFAKANAVYNPIVYGISHPKY

510\_Cataglyphis\_bombycinus AWTPYLVINYAGIFET-VKINPLFTIWGSLFAKANAVYNPIVYGISHPKY

510\_Camponotus\_abdominalis AWTPYLVINYSGIFET-TKISPLFTIWGSLFAKANAVYNPIVYGISHPKY

520\_Schistocerca\_gregaria GWTPYLIINFTGIFET-MKISPLLTIWGSLFAKANAVFNPIVYGISHPKY

430\_S\_gregaria SWTPYAVVAMIGAFGNRAALTPLSTMIPAVTAKIVSCIDPWVYAINHPRF

437\_D\_melanogasterRh5 AWTPYSVVALIGCFGEQQLITPFVSMLPCLACKSVSCLDPWVYATSHPKY

508\_Drosophila\_melanogasterRh6 AWTPYTIINYAGIFES-MHLSPLSTICGSVFAKANAVCNPIVYGLSHPKY

492\_Sepia\_officinalis SWSPYAVVALLAQFGPIEWVTPYAAQLPVMFAKASAIHNPLIYSVSHPKF

529\_Cambarus\_ludovicianus AWTPYLLINWVGMFAR-SYLSPVYTIWGYVFAKANAVYNPIVYAIS----

526\_Cambarellus\_shufeldtii AWTPYLLINWVGMFAR-SYLSPVYTIWGYVFAKANAVYNPIVYAIS----

530\_Orconectes\_virilis AWTPYLLINWVGMFAR-SYLSPVYTIWGYVFAKANAVYNPIVYAIS----

522\_Procambarus\_milleri AWTPYLLINWVGMFAR-SYLSPVYTIWGYVFAKANAVYNPIVYAIS----

360\_C\_bombycinus SWTPYGTLAMIGAFGNKALLTPGVTMIPACTCKFVACLDPYVYAISHPRY

360\_C\_abdominalis SWTPYGALAMIGAFGNRALLTPGITMIPACACKFVACLDPYVYAISHPRY

439\_A\_mellifera AWTPYATVALIGVYGNRELLTPVSTMLPAVFAKTVSCIDPWIYAINHPRY

353\_A\_mellifera SWTPYGVMSMIGAFGNKALLTPGVTMIPACTCKAVACLDPYVYAISHPKY

520\_Papilio\_xuthusRh1 AWTPYLVINFTGIFET-ATISPLGTIWGSVFAKANAVYNPIVYGISHPKY

520\_P\_xuthusRh2 AWTPYLVINYTGVFET-APISPLATIWGSVFAKANAVYNPIVYGISHPKY

575\_P\_xuthusRh3 AWTPYLVINFAGVFET-APISPVSTIWGSVFAKANAVYNPIVYGISHPKY

450\_M\_sexta AWTPYAFVTMTGAFGDRTLLTPIATMIPAVCCKVVSCIDPWVYAINHPRY

520\_Manduca\_sexta AWTPYLVINYTGVFES-APISPLATIWGSLFAKANAVYNPIVYGISHPKY

357\_M\_sexta SWTPYGVMALIGAFGNQQLLTPGVTMIPAVACKAVACISPWVYAIRHPMY

460\_P\_xuthusRh4 GWTPYAFVTMTGAYGDRSLLTPVATMIPAVCCKIVSCIDPWVYAINHPRY

P\_xuthus\_Rh5 SWTPYGVMSLIGAFGDQNLLTPGVTMIPALACKGVACIDPWVYAISHPKY

570\_Heliconius\_erato AWTPYLVINYAGIFKT-MTISPIVTIWGSVFAKANAV-------------

550\_Heliconius\_sara AWTPYLVINYAGIFKT-MT-------------------------------

510\_Galleria\_mellonella AWTPYLAINYTGVFES-APISPLATIWGSLFAKAN---------------

515\_Spodoptera\_exigua AWTPYLVINYAGVFES-ATISPLATIWGSLFAKAN---------------

510\_Junonia\_coenia AWTPYLVINYSGIFET-ATITPLATIWGSVFAKAN---------------

560\_Bicyclus\_anynana AWTPYLVINYAGIFET-MTISPLVTIWGSVFAKANAVYNPFVYGIGSR--

493\_Loligo\_pealii SGSPYAMVALLAQFGPLEWVTRYAAQLPVMFAKASAIHNPMIYSVSHPKF

529\_Bombus\_terrestris AWTPYLVINWSGIFSL-VKISPLYTIWGSLFAKANAV-------------

553\_Osmia\_rufa AWTPYLVINFSGCFEL-VKISPLFTIWGSLFAKANAV-------------

540\_Pieris\_rapae AWTPYLVINFAGVFET-SPISPLSTIWGSVFAKANAVYNPIVYGISHPKY

489\_Neogonodactylus\_oerstediiR AWTPYLIINWAGMFYP-SVVSPLFSIWGSVFAKANAVYNPIVYAISHPKY

528\_N\_oerstediiRh2 AWTPYAIINIAGLTNK-EIVTPLFFIWGSVFAKANTVYNPIEYAISHPKY

522\_N\_oerstediiRh3 AWTPYLIINWAGMFYP-SVVSPLFSIWGSVFAKSNAVYNPIVYAISHPKY

496\_Archaeomysis\_grebnitzkii AWTPYMIINFTGMNDR-TKLTPLCTIWGSL--------------------

487\_Euphausia\_superba AWTPYCVINVTGMWDK-TKITPLFTIWGSL--------------------

512\_Holmesimysis\_costata AWTPYFIINWGGMFNK-PMVTPLFS-------------------------

515\_Homarus\_gammarus AWTPYLIINWAGMINK-PSVSPLLTI------------------------

501\_Mysis\_diluviana AWTPYLVINIVGMVAR-QQLNPLSTI------------------------

520\_Neomysis\_americana AWTPYFIINWAGMLSK-SNVTPLFSIWGSV--------------------

530\_Vanessa\_cardui AWTPYLVINYAGIFET-ATITPLATIWGSVFAKANAVYNPIVYGISHPKY

Homo\_sapiens\_GPR52 LWLPYIIYFLLES--SRVLDNPTLSFLTTWLAISNSFCNCVIYSLSNSVF

Homo\_sapiens\_MTNR1A CWAPLNFIGLAVASDP-ASMVPRIPEWSYYMAYFNSCLNAIIYGLLNQNF

Anolis\_carolinensis\_pinealOpsi CWLPYASFAMVVATNKDLLIQPALASLPSYFSKTATVYNPIIYVFMNKQF

478\_D\_melanogasterRh1 AWTPYLVINCMGLFKF-EGLTPLNTIWGACFAKSAACYNPIVYGISHPKY

375\_D\_melanogasterRh4 SWTPYGVMSLIGAFGDKSLLTQGATMIPACTCKLVACIDPFVYAISHPRY

Bostaurus\_rhodopsin CWLPYAGVAFYIFTHQGSDFGPIFMTIPAFFAKTSAVYNPVIYIMMNKQF

Parhyale\_Ops2 RQAMQTEVPCCCVQEPDDSTSDAKSTATEQQN---ESK-----------

Parhyale\_Ops1 RAALEKKLPCLSCSGGDGASDSVSVTTTQSEQPVTEKSESA--------

Hyalella\_azteca RQAMMTEIPCCCVHEPDDSTAESKSAVTEQQV---AEK-----------

SW\_Procambarus\_clarkii RLELQKRMPWFCIHEEKPQDTISQSTCETEKA-----------------

LW-like\_Daphnia\_magna RECLKQMFPWMCIVEEKKAAADNQSVISDKTEMEIVKCESA--------

UV-like\_Daphnia\_magna RLELMKRLPWLCVHEKDECAKEESSNASVISE---AESRT---------

BLUE-like\_Daphnia\_magna RMELQKKMPWFCVHEPVPSDDSSLASATTEMS-GVAKETSS--------

494\_Loligo\_forbesi RERIASNFPWILTDEKEIEDDKDAEAEIPAGEQGGETADAAQMKEMMAP

475\_Enteroctopus\_dofleini REAIQTTFPWLLTDEKECEDANDAEEEVVASERGGESRDAAQMKEMMAP

490\_Calliphora\_erythrocephalaR GIALKEKCPCCVFGKVDDGKASDATSQATNNE---SETKA---------

520\_Limulus\_polyphemus KAALYQRFPSLACGSGESGSDVKSEASATTTME--EKPKIP--------

530\_L\_polyphemus KAALYQRFPSLACGSGESGSDVKSEASATMTME--EKPKSP--------

420\_D\_melanogasterRh2 RIVLKEKCPMCVFGNTDEPKPAPASDTETTSE---ADSKA---------

345\_D\_melanogasterRh3 RMELQKRCPWLALNEKAPESSAVASTSTTQEP---QQTTAA--------

533\_Procambarus\_clarkii RAAMEKKLPCLSCKTESDDVSESASTTTSSAE---EKAESA--------

515\_Sphodromanti\_ssp RAALNKKFPSLACASEPDDTASQASGATTVSD---EKSASA--------

480\_Todarodes\_pacificus REAISQTFPWVLTDDKETEDDKDAETEIPAGESAAPSADAAQMKEMMAP

Gallus\_gallus\_pinealOpsin QSCLLEML---CCGYQ-PQRTGKASPGTPGPH---ADVTAAGLRNKVMP

499\_Loligo\_subulata REAIASNFPWILTDEKEIEDDKDAEAEIPAAEQGGESVDAAQMKEMMAP

480\_Hemigrapsus\_sanguineus RLAITQHLPWFCVHEKDPNDVEENQSSNTQTQ---EKS-----------

529\_Apis\_mellifera RAALFAKFPSLACAAESSDAVSTTSGTTTVTDN--EKSNA---------

510\_Cataglyphis\_bombycinus RAALFQRFPSLACSSGPAGADTLSTTTTVTEGT--EKPAA---------

510\_Camponotus\_abdominalis RAALFQKFPSLACTTEPTGADTMSTTTTVTEGN--EKPAA---------

520\_Schistocerca\_gregaria RAALEKKFPSLACASSSDDNTSVASGATTVSD---EKSEKSA-------

430\_S\_gregaria RAEVQKRMKWLHLGEDARSSKSDTSSTATDRT---VGNVSASA------

437\_D\_melanogasterRh5 RLELERRLPWLGIREKHATSGTSGGQESVASV---SGDTLALSV-----

508\_Drosophila\_melanogasterRh6 KQVLREKMPCLACGKDDLTSDSRTQATAEISE---SQA-----------

492\_Sepia\_officinalis REAIAENFPWIITDEKEVEDDKDAETEIPATEQGGESADAAQMKEMMAP

529\_Cambarus\_ludovicianus -------------------------------------------------

526\_Cambarellus\_shufeldtii -------------------------------------------------

530\_Orconectes\_virilis -------------------------------------------------

522\_Procambarus\_milleri -------------------------------------------------

360\_C\_bombycinus RLELQKRLPWLELQEKPI-ETQSTTTETVNTA---SS------------

360\_C\_abdominalis RLELQKRLPWLELQEKPVADTQSTTTEMVHTP---AS------------

439\_A\_mellifera RQELQKRCKWMGIHEPETTSDATSAQTEKIKTD----------------

353\_A\_mellifera RLELQKRLPWLELQEKPISDSTSTTTETVNTP---PASS----------

520\_Papilio\_xuthusRh1 RAALYQRFPSLACQPAADDNTSQVSGKTAVCE---EKPSA---------

520\_P\_xuthusRh2 RAALYQKFPSLACQPSAEETGSVASGATTACE---EKPSA---------

575\_P\_xuthusRh3 RAALYQRFPSLACQPSPDESGSVASGNTAVCE---EKAPA---------

450\_M\_sexta RAELQKRLPWMGVREQDPDAVSTTTSVATAGF---QPPAAEA-------

520\_Manduca\_sexta QAALYAKFPSLQCQSAPEDAGSVASGTTAVSE---EKPAA---------

357\_M\_sexta RQELQRRMPWLQIDEPDDTVSTATSNTTNSAP---PAATA---------

460\_P\_xuthusRh4 RAELQKRLPWLGVREQDPDTVSNSNSVTTTQS---HTPTAEA-------

P\_xuthus\_Rh5 RQELQKRMPWLQIDEPDDNASNTTSNTANSSA---PA------------

570\_Heliconius\_erato -------------------------------------------------

550\_Heliconius\_sara -------------------------------------------------

510\_Galleria\_mellonella -------------------------------------------------

515\_Spodoptera\_exigua -------------------------------------------------

510\_Junonia\_coenia -------------------------------------------------

560\_Bicyclus\_anynana -------------------------------------------------

493\_Loligo\_pealii REAIASNFPWILTDEKEIEDEKDAEAEIPACEQGGESADAAQMKEMMAP

529\_Bombus\_terrestris -------------------------------------------------

553\_Osmia\_rufa -------------------------------------------------

540\_Pieris\_rapae RAALYQRFPALACQPSAEETGSVASAATACTE---EKPSA---------

489\_Neogonodactylus\_oerstediiR RAALYKKLPCLACSTESADEGSATNSATTTTA---EKYESA--------

528\_N\_oerstediiRh2 KGALYQKLPWLQCAPDVPEDDSKSTASTTTTG---GEEKA---------

522\_N\_oerstediiRh3 RAALYKKLPCLACSTESADEGSATNSTTTATA---EKYESA--------

496\_Archaeomysis\_grebnitzkii -------------------------------------------------

487\_Euphausia\_superba -------------------------------------------------

512\_Holmesimysis\_costata -------------------------------------------------

515\_Homarus\_gammarus -------------------------------------------------

501\_Mysis\_diluviana -------------------------------------------------

520\_Neomysis\_americana -------------------------------------------------

530\_Vanessa\_cardui RAALYARFPALACQPSPEDNASVASAATAT-E---EKPSA---------

Homo\_sapiens\_GPR52 RLGLRRLSETMCTSCM-CVKDQEAQEPKPRKR---ANSCSI--------

Homo\_sapiens\_MTNR1A RKEYRRIIVSLCTARVF--FVDSSNDVADRVK---WKPSPLMTNNNVV-

Anolis\_carolinensis\_pinealOpsi RSCLLSTL---SCGRR-PQAAQGTTPAAISSP---RGRTLEGSRNKVVP

478\_D\_melanogasterRh1 RLALKEKCPCCVFGKVDDGKSSDAQSQATASE---AESKA---------

375\_D\_melanogasterRh4 RLELQKRCPWLGVNEKSGEISSAQSTTTQEQQ----QTTAA--------

Bostaurus\_rhodopsin RNCMVTTL---CCGKN-PLGDDEASTTVSKTE---TSQVAPA-------