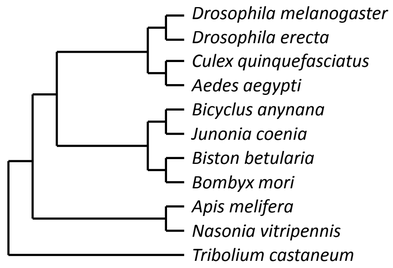
A)




## B) Antennapedia

```
D.melanogaster     EGGSPPLVDQMSGHHMNAQMTLPHHMGHPQAQLGYTDVGVP---DVTEVHQNHHNMGMYQQQSGVPPVGAPPQGMMHQGQGPPQMHQGHPGQHTPPS--------QNPNSQSSGMP 280
D.erecta           EGGSPPLVDQMSGHHMNAQMTLPHHMGHPQAQLGYTDVGVP---DVTEVHQNHHNMGMYQQQSGVPPVGAPPQGMMHQGQGPPQMHQGHPGQHTPPS--------QNPNSQSSGMP 280
B.anynana          VPGSPPLEQAQQMP----------HHMHP--QQHM-QHGMP---PHQQHVMYPVDDMQHQTQM--PPMHQQSM----HPQQAPPQQ-------------------PPPNTNASLP 74
B.mori             VPGSPPLEQAQQMP----------HHMHP--QQHMVQHGVP---PHQQHLMYPVDDMQHQTQM--PPMHQQSM----HAQQPPPQQ-------------------PPPNTKPSLP 165
T.castaneum        PTGSPPLTTQSMNN----------HHMGHHMQEQHPQHHQP---HHQQ------QHMMYGGQQ-GANMHQQGP----PHQQPPIQQQPNQGQ------------QPPGNTAAALP 231
A.mellifera        GPDSPPLVESQMHHQM--------HTQHPHMQPQQGQHQSQ---AQQQHLQAHEQHMMYQQQQQSQAASQQSQ----PGMHPRQQQQAQQHQGVVTSPLSQQQQAAPQGAASANLP 257
C.quinquefasciatus ENGSPPLEQMGHHMN---------TAQMTIPQHHMGHAQG-------QVHQNPQHMGMYTNTGGGPPGVVPQQPPNMMHQQPPQLHQGQQPP-------------PNSQNSNSGLQ 268
A.aegypti          ENGSPPLEQMGHHMN---------TAQMTIPQHHMGHAQGQDCFPPDQVHQNPQHMGMYTNTGGGPPGVVPQQPPNMMHQQPPQLHQGQQPP-------------PNSQNSNSGLQ 232
                     .****                    *   .       :    .  :                .  :                                        . :

D.melanogaster     SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHFNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKTKGEPGSGGEGDEITPPNSPQ- 374
D.erecta           SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHFNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKTKGEPGSGGEGDEITPPNSPQ- 374
B.anynana          SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHFNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKTKG------------------- 150
B.mori             SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHFNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKTKGEPGSGDEPDNMSPPTSPQ- 259
T.castaneum        SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHFNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKTKGEGGSEGGGDDISPQGSPQ- 325
A.mellifera        SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHYNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKSKGTPGSGDGDTEISPQTSPQG 352
C.quinquefasciatus SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHFNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKTKGEPGSGDE-NDMTPPQSPA- 361
A.aegypti          SPLYPWMRSQFERKRGRQTYTRYQTLELEKEFHFNRYLTRRRRIEIAHALCLTERQIKIWFQNRRMKWKKENKTKGEPGSGDE-NDMTPPQSPA- 325
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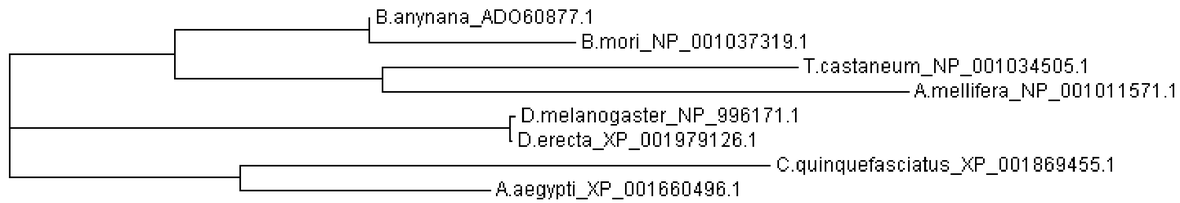
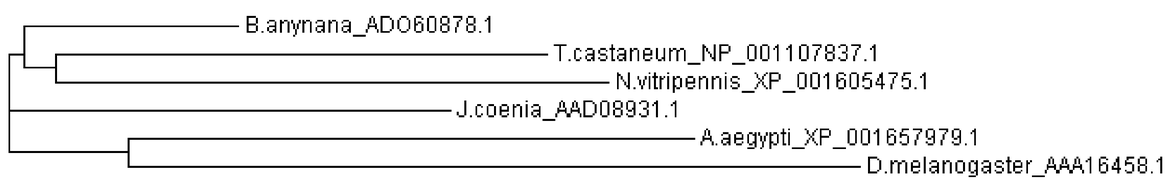
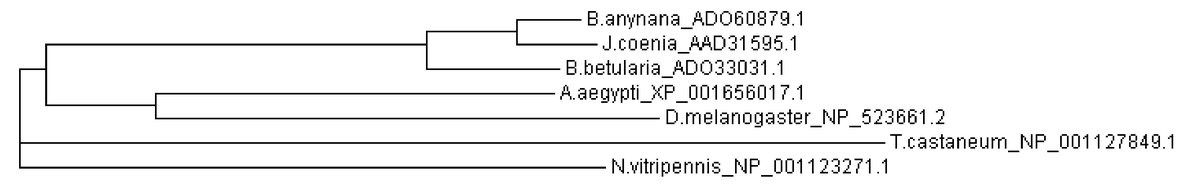



## C) Hedgehog

```
T.castaneum        GPGRGVGRRRGPRKLTPLVFKQHVPNVPENTLTASGLTEGRIGRNDSRFKDLVPNYNQDIVFKDEEGTGADRLMTQRCKEKLNTLAISVMNQWPG 118
N.vitripennis      GPGRGGGRRPILRKLTPLVFKQHVPNVSENTLPASGLGEGRVSRNDKRFRDLVPNYNVDIIFKDEEGTGADRLMTQRCKEKLNTLAISVMNQWPG 136
B.anynana          AGGRGFTHRHGPRRMTPLVFNQHEPNISENSKSASGPPEGRITREDEKFKDLVPNYNPDIEFKDDEGTGADRHMTQRCKEKLNTLAISVMNQWPG 95
J.coenia           ------------------------------KSASGPPEGRITRDDEKFRDLVPNYNPDIDFKDDEGTGADRLMTQRCKEKLNTLAISVMNQWPG 64
A.aegypti          GPGRGIGGPRRTRKLLPLVFKQHVPNVSENSLGASGMQEGPISRNDSKFRNLETNYNKDIIFKDEEGTGADRVMTQRCKEKLNILAVSVMNQWPG 133
D.melanogaster     GPGRGLG-RHRARNLYPLVLKQTIPNLSEYTNSASGPLEGVIRRDSPKFKDLVPNYNRDILFRDEEGTGADRLMSKRCKEKLNVLAYSVMNEWPG 179
                                                   ***  ** : *:. :*::* .*** ** *:*:******* *::******* ** ****:***

T.castaneum        VRLLVTEGWDEE-GYHTPESLHYEGRAVDITTSDRDRSKYGMLARLAVEAGFDWVYYESRAHIHCSVKSESSQAAKYGGCFSGESTVL 205
N.vitripennis      VKLRVTEGWDEE-GKHATDSLHYEGRAVDVTTSDRDRAKYGMLARLAVEAGFDWVYYESRSHIHCSVKSESSSAGKSGGCFPGASLVR 223
B.anynana          VRLRVIEGWDEENSAHLENSLHYEGRAVDITTSDRDRSKYGMLARLAVEADFDWVFYESRSYIHCSVKTESS-VGTGAGCFPSGSVVH 182
J.coenia           VRLRVIEGWDEE-NSHLDNSLHYEGRAVDLTTSDRDHSKNGMLARLAVEAGFDWVFYENRSYIHCSVKTESS-VGTGAGCFPSGAVVH 150
A.aegypti          LRLMVTEGWDED-HMHARESLHYEGRAVDIMTSDKDRSKIGMLARLAVEAGFDWVYYESRSHIHCSVKSDSSQSNHASGCFTGDSTVQ 220
D.melanogaster     IRLLVTESWDED-YHHGQESLHYEGRAVTIATSDRDQSKYGMLARLAVEAGFDWVSYVSRRHIYCSVKSDSSISSHVHGCFTPESTAL 266
                   ::* * *.***:   *  :********* : ***:*::* **********.**** * .* :*:****::**      ***.  : .
```




## D) Patched

```
B.anynana          SKLLGPEYPIFVPH-LKNKLQWTHLNPLEVLEEVKKLK----FQFPLST-----------SKLLGPEYPIFVPH-LKNKLQWTHLNPLEVLEEVKKLK----FQFPLST 44
J.coenia           SKLLGPDYPIYVPH-LKHKLQWTHLNPLEVVEEVKKLK----FQFPLSTIITPLDCFWEGSKLLGPDYPIYVPH-LKHKLQWTHLNPLEVVEEVKKLK----FQFPLST 266
B.betularia        SKLLGPDYPIFVPG-LQHKLQWTHLNPQEVLEEVRKLK----FQFPFST-----------SKLLGPDYPIFVPG-LQHKLQWTHLNPQEVLEEVRKLK----FQFPFST 44
A.aegypti          SKLLGPEYPVVIPH-LANKVQWTSLNPQNLLKDIKAQN----YQFPFDTIITPLDCFWEGSKLLGPEYPVVIPH-LANKVQWTSLNPQNLLKDIKAQN----YQFPFDT 215
D.melanogaster     SQLLGPESAVVIPG-LNQRLLWTTLNPASVMQYMKQKMSEEKISFDFETIITPLDCFWEGSQLLGPESAVVIPG-LNQRLLWTTLNPASVMQYMKQKMSEEKISFDFET 263
N.vitripennis      SKMLGAHVAYVPHI-WNEPLKWTSLNPTLMLEEMKKRFAQ--YSFSYKIIITPLDCFWEGSKMLGAHVAYVPHI-WNEPLKWTSLNPTLMLEEMKKRFAQ--YSFSYKI 296
T.castaneum        SKLLGPDYPVHIPYGIGKHIKWTNLNPSQLVSELKQKE----SQFDYHSIITALDCFWEGSKLLGPDYPVHIPYGIGKHIKWTNLNPSQLVSELKQKE----SQFDYHS 243
                   *::**.. .       . : ** ***  ::. ::       .*                *::**.. .       . : ** ***  ::. ::       .*

B.anynana          PEQLIVGGATRNSTSALRSARALQTXVQLMGEREMYEYWA--DHYKVHQIGWNQEKAAAVLDAWQRKFAAEVKKMTTSSS-VSAAYSFYPFSTSTLNDILGKFSEVSLKNIILGYMFMLI 221
J.coenia           PEQLIVGGATRNSTSALRSARALQTVVQLMGEREMYEYWA--DHYKVHQIGWNQEKAAAVLDAWQRKFAAEVRKITTSGS-VSSAYSFYPFSTSTLNDILGKFSEVSLKNIILGYMFMLI 443
B.betularia        PEQLIVGGATRNVTSALRAARALQSVVQLMGEREMYEYWA--DHYKVHHVGWTQEKAAAVLDSWQRKFAIEVRRMTTTES-VSPXYSFYPFSTSTLNDILGKFSELSLKNIILGYMFMLI 221
A.aegypti          PEELIVGGATRNRSQHLKTAKALQTVIQLMGEREMYDYWN--NHYKVHHIGWNPEKAAEVLNAWQKKFSAEVNKIMQTEVKPLSYYEVFAFSSAALDDILGKYSNPNPISLGIGIVVILI 393
D.melanogaster     PEELIVGGAKRNRSGHLRKAQALQSVVQLMTEKEMYDQWQ--DNYKVHHLGWTQEKAAEVLNAWQRNFSREVEQLLRKQSRIATNYDIYVFSSAALDDILAKFSHPSALSIVIGVAVTVL 441
N.vitripennis      PEELLVGGAKHNKTGQLTRAAALQTVIQIMGEREFYDYYARVDTDKVKYTDWTQEKATQVLETWQREFTKQVKLQQNTTD--SRPYNLFAFSTTSMNDILGKYSELSFVRIIVGSGLMFL 474
T.castaneum        PEDLIVGGANKNKSGHIKQAKALQTVVQLMGEHELFEFWS--GHYKVHHIGWNQEKATTVLNAWQKKFAQEVDRLTKSKK--SSNYIFVTFSTANLNKMLKEASKTDVVKLGVVLGVAAV 419
                   **:*:****.:* :  :  * ***: :*:* *:*::: :   .  **:  .*. ***: **::**::*: :*     .       * .  **:: ::.:* : *. .   : :   .  :

B.anynana          YVAVTLIQWRDPIRSQAGVGIAGVLLLSITVAAGLGFCALLGIPFNASSTQIVPFLALGLGVQDMFLLTHTYVEQAG-DVPREERTGLVLKKSGLSVLLASLCNVMAFLAAALLPIPAFR 340
J.coenia           YVAVTLIQWRDPIRSQAGVGIAGVLLLSITVAAGLGFCALLGIPFNASSTQIVPFLALGLGVQDMFLLTHTYVEQAG-DVPREERTGLVLKKSGLSVLLASLCNVMAFLAAALLPIPAFR 562
B.betularia        YVAVTLMQWRDPVRSQAGVGIAGVLLLSITVAAGLGFCALLGIPFNASSTQIVPFLALGLGVQDMFLLTHTYVEQSG-DVPREERTGLVLKKSGLSVLLASLCNVMAFLAAALLPIPALR 340
A.aegypti          YAAITLLRWKDPVNGQSGVGAAGVLLIGVTTAAGLGFCALLGIAFNAATTQVIPFLALGLGVDHIFVLTHAYAERD-----NNEQTGQVLKKAGLSILFSGASTAGSFFAAAMIPVPALR 508
D.melanogaster     YAFCTLLRWRDPVRGQSSVGVAGVLLMCFSTAAGLGLSALLGIVFNAASTQVVPFLALGLGVDHIFMLTAAYAESN-----RREQTKLILKKVGPSILFSACSTAGSFFAAAFIPVPALK 556
N.vitripennis      YAGVVLIRWNDRVKSQSGIGIAGVMLVIASLAAGLGFCALLGIPFNATSTQIVPFLILGLGIHDMFLLTHTYAELSVYDLPRNQQTGVVLKRAGLSILLTGLCNVVSFFAAAIIPIPALR 594
T.castaneum        YGWV----------AQSGLAALGVLVLASSAAAALGVCSLIGLPINLLSTHVLPFVTVGLAMREMFLILSTHMRNLS--------PPEVLQRTGPSIISAALVNSAAFLAAAVLPVPALR 521
                   *              .*:.:.  **:::  : **.**..:*:*: :*  :*:::**: :**.: .:*::  :: .           .  :*:: * *:: :.   .  :*:***.:*:**::

B.anynana          VFCLQAAILLLFNLGSMLLVFPAMISLDLRRISAARADLLCCLMP---------ESPLPK--KKIPERAKSRSGKTDKNNRLDTTRQPLDP-DVTGEQPKACCLSVSLTKWVKNQYAPFI 448
J.coenia           VFCLQAAILLLFNLGSILLVFPAMISLDLRRRSAARADLLCCLMP---------ESPLPK--KKIPERAKTR--KNDKTHRIDTTRQPLDP-DVSENVTKTCCLSVSLTKWAKNQYAPFI 668
B.betularia        VFCLQAAILLLFNLGSMLLVFPAMISLDLRRRSASRADLLCCLTP---------ESPLPKRTKKLAERTRGRTVKTDKTNWKDTSKQPLDPQDTGAAAKKTCCISISLTKWAKNQYAPFI 451
A.aegypti          VFCFQGAVLLVFNLAAVLLVFPAMVSLDLRRRRAGRADILCCCL-----------PALPTT--NHDVKQRQQHQTAN-------ADDSLIDC------PTKACFSFSISKFAVKHYAPFI 602
D.melanogaster     VFCLQAAIVMCSNLAAALLVFPAMISLDLRRRTAGRADIFCCCFPVWKEQPKVAPPVLPLN--NNNGRGARHPKSCNNNRVPLPAQNPLLEQRADIPGSSHSLASFSLATFAFQHYTPFL 674
N.vitripennis      VFSLQAAVLLLFNLGAMLLIFPAMISLDLRRRRAGLYDIMCCVRA----------NDSESQEACTQVHSRCKLASINNNESFAGEEETLTG------FSSNDCYSFSPTQLVAKHYAKFV 688
T.castaneum        VFCLQCAVLVIFHGAALLIVFPSLLALEQRCR---KTDVPCFRN-----------------------ETKSKPPTNNNNDPEHGENLLTA------EVICQQKKSLLTWLVNRYFTSVL 608
                   **.:* *:::  : .: *::**::::*: *       *: *                                    :         : *                .   :  . . :: .:

B.anynana          MRPAVKVTSMLALIVVILASVWGATKVKDGLDLTDIVPEHTDEREFLTRQEKYFGFYNMYAVTQGDFEYPTNQKLLYEYHDQFVRIPNIIKNDNGGL--TKFWLGLFRDWLLDLQDAFDK 566
J.coenia           MRPAVKVTSMLALIAVILTSVWGATKVKDGLDLTDIVPENTDEHEFLSRQEKYFGFYNMYAVTQGNFEYPTNQKLLYEYHDQFVRIPNIIKNDNGGL--TKFWLSLFRDWLLDLQVAFDK 786
B.betularia        MRPSVKVTSMLALIAVILASVWGATKVKDGLDLTDIVPENTDEHEFLYRQEKYFGFYSMYAVTQGDFEYPTNQKLLYEYHDQFVRIPNIIKNDNGGL--TKFWLSLFRDWLLDLQVAYDK 569
A.aegypti          TKSSIKVLSMLLLTGIIGVSLFASMKLPDGLELTDLVPQNTNEHKFLSVQGKLFGFYSMFAVTQGDFEYPTNQKLLHEYHEAFVRVSHVIKNDNGGL--PEFWLSLFRDWLINLQKAFDR 720
D.melanogaster     MRSWVKFLTVMGFLAALISSLYASTRLQDGLDIIDLVPKDSNEHKFLDAQTRLFGFYSMYAVTQGNFEYPTQQQLLRDYHDSFVRVPHVIKNDNGGL--PDFWLLLFSEWLGNLQKIFDE 792
N.vitripennis      TRPFTKVIGVMLLAALLTASTWQALRLDDGLDLADLVPLRSDEHAFLSAQTKHFGFYNMFAITGRDFEYPNNQKLLLDYHESFMRIKNVIKNDDGGL--PEFWLTIFRDWLRNLQESFDR 816
T.castaneum        VKPFVKVVLCLTYAVLIIFCVFNGLKLEFDVRLSTFLPKNTQEYKYLEAQNKFFGFYNFYLVTT-ELEYPLSQPLLYEYHSSLTNVPHVLKDSNGGLNMNDFWLANFRDFLLDLQQEFDL 727
                    :.  *.   :    :  . : . ::  .: :  ::*  ::*  :*  * : ****.:: :*  ::*** .* ** :**. : .: :::*:.:***   .***  * ::* :**  :*

B.anynana          EVASGCITQEYWCKNATDEGILAYKLMVQTGHVDNPIDKSLIN----SGHRLVDKDGIINPKAFYNYLSAWATNDALAYGASQGNLKPQPQRWIHSPEDVHLEIKKSSPLIYTQLPFYLS 682
J.coenia           EVASGCITQEYWCKNASDEGILAYKLMVQTGHVDNPIDKSLIT----AGHRLVDKDGIINPKAFYNYLSAWATNDALAYGASQGNLKPQPQRWIHSPEDVHLEIKKSSPLIYTQLPFYLS 902
B.betularia        EIESGCITQEYWCKNASDEGILAYKLMVQTGYVDNPIDKSLVTTDTKNGHRLVDKDGIINPKAFYNYLSAWATNDALAYGASQGNLKPQPKRWTHSPGDVDLKIPKSSPLIYTQLPFYLS 689
A.aegypti          DYREGRITQERWFSNASDDAILAYKLLVQTGHVDNPIDKSLVA-----QVRLVDSEGVINPRAFYNYLSAWAWNDVLAYGASQGNLRPEPREWFHSPSDFELKIPKSAPLTYTQLPFYLH 835
D.melanogaster     EYRDGRLTKECWFPNASSDAILAYKLIVQTGHVDNPVDKELVL-----TNRLVNSDGIINQRAFYNYLSAWATNDVFAYGASQGKLYPEPRQYFHQPNEYDLKIPKSLPLVYAQMPFYLH 907
N.vitripennis      DYKNNCLNAEGWFRNASDEGILAYKLLAQTGHVDNPIDKSLIT-----QVRLVNSEGIINPRAFYNYLSAWATNDAFAYGASQANLRPQPRQWFYG-DDEELKIPKSMPITYAQMPFYLH 930
T.castaneum        NRKNNFLNSEKWFPNATEKAVLAFKLLAQTGIVEFPVDKSQIF-----KKQLVDK-GIIDPKAFYNYLSVWNSNDQMSYSSSQANLTPKPCQHYSSKAEFDLKIPKSRPLVYTQMPFYLK 841
                   :  .. :. * *  **:....:**:**:.*** *: *:**. :        :**:. *:*: :*******.*  ** ::*.:**.:* *:* .      : .*:* ** *: *:*:****

B.anynana          GLSDTDSIKTLIRSVRELCLKYEAKGLPNFPSGIPVLVLGQYLYLRTSLLLALACALGAVFI 744
J.coenia           GLSDTDSIKTLIRSVRDLCLKYEAKGLPNFPSGIPFLFWEQYLYLRTSLLLALACALGAVFI 964
B.betularia        GLSDTESIKTLIMSVRELCLKFEAKGLSNFPSGI---------------------------- 723
A.aegypti          GLSDTQDIKVMIGQIRELSRRFEARGLPNYPSGIPFLFWEQYMNLRPCLLKAIGCALVAAFC 897
D.melanogaster     GLTDTSQIKTLIGHIRDLSVKYEGFGLPNYPSGIPFIFWEQYMTLRSSLAMILACVLLAALV 969
N.vitripennis      KLTETADITELITSVRQLCRKFEEKGLPNFPSGIPFIFWEQYMDLRSCLGIALLVALIASII 992
T.castaneum        NLKSTGKIIETLKQIKQISEEYNQRGLKNYPIGLIFAYFNQFLLLDRLLAAQLVLTLLAAVL 903
                    *..* .*   :  ::::. .::  ** *:* *:
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