

Supplementary Table 1

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 1 NW_020538040 - QVAO01001886	-33972894 - 33957255	2	CYP304U3	>Ctenocephalides_felis-1886-33972894-CYP304U3 MASPFIIGLAIALIIYWLRYNSTDRPKNFPPGPPRLPIWGSYWFILLANYHFL HIAFIRLCKFYKTKILGFFAGAFPTIIQDHTIREVLNRRREFDGRPDIIARLR DPKLELRGIFFTDGAFWHEQRRFALRYFRDFGFGKRSPLENLIRDDISDL INLLRHGPEERDENTVCRDGLVLPDLFFAVFMNSFMAVTRQHWPRSK HHELLKVARGAMVFORAGDDMGRALSQTPWLRHVMPEFSGYNDLREGN KCLYDFMKKCVQPTIETHQYGIERNFVDIYLNEMERQQTDLCEETLTSFS VEQLILVGDIFLLPTITALTAQISYLFHIMRQPDVQEKVQEEIDREVGVTRS PNLDDRINMPYTEACLREVMRIDTLVPMNIPKTLADTTLNGFDIPKNTMVL TNLWGMHHDADIWGDPEVFRPERFLDCKGMLKKKDITLPGAGKRLCAG ETFARQGLFLMFAQLMQUHYTFSPAPGLPRPSANNKLSGFVLTPKDWWVK YSQRCC			<b>XP_026470615</b>
Big 1 NW_020538040 - QVAO01001886	-33992083 - 33973357	2	CYP304U2	>Ctenocephalides_felis-1886-33992083-CYP304U2 MANPIIVAAVVALVYWLKQATERPKNFPPGPPRLPIWGSYWLILLANYKF LHIAFMKIAKLYKSKIIGFYAGAFPGVIVQDYETVKEVLNRRREFDARMIIAR MRDPSHNTRGIFFTDGGQFWHEQRRFALRYMRDFGFGRRCPTEAMINEE LNDLNLKNGPIEKDEDVCKNGLVLPDIFVAFMNSFMAVFSRERWPR SKHHELIRVARGAMIFQAGDDMGRALSQTPWLRHLLPNFSGYNELKDG HEFIYDFMKQCVQNVVDTHQDGDERNFVDIYLNEMHKRQDPTIAEKDGI SFSIDLILVGDVFLFPTTAIGAQLSYLFFHLMYRPDVQEKIQEEIERVVG GRLPNLDDRRPHMPYTESCLREVLRLLETVPLNLPHRQDITLNGYDIPK NTMVLTNLWNMHRDPELWGDGEAFRPERFLDSRGLMLKKKDITMPPGAG KRLCAGETFARQGLFLMFAQLMQUHYTFSPAPGKPKPPHGLSGFILTPKD VWIKYEAR			<b>XP_026470616</b>
Big 1 NW_020538040 - QVAO01001886	-34000748 - 34000419	2		exons 7 - 8	CYP304U1		
Big 1 NW_020538040 - QVAO01001886	+34018994 - 34019758	2		exons 7 - 8 - 9	CYP304U1		XP_026470618
Big 1 NW_020538040 - QVAO01001886	+34026283 - 34039924	2		exons 1 to 6, frameshift in exon 6	CYP340U2		XP_026470619
Big 1 NW_020538040 - QVAO01001886	-34045168 - 34045073	2		exon 1	CYP340U2		
Big 1 NW_020538040 - QVAO01001886	-34065234 - 34052660	2	CYP304U1a	>Ctenocephalides_felis-1886-34065234-CYP304U1a MANPVIVFIAMVVFYWMYKLATERPKNFPPGPPRLPIWGSYWFILLANYTF LQLAFTKIAKLYKSKIIGFYAGDFLGVAADQYETIKEILNKKEFDGRMDVILA RMRDPKENLRGIFFTDGNFWHEQRRFALRYMRDFGFGRRCPSEAMINE ELNDLNLKNGPVEKDENVCRDGLIMPNIFFMAFINSFMAVFSRERWP RSKHHELKLRGAMVFORAGDDMGRALSQTPWLRHIIPEMSGYNDLKR GNKVIYEFIEKNVESIMKQHEGDDRSFVDIYLNEMTKRQKNIFNKDDETT FSVDQLITGADFLFPSTTALGVQLCYLFFHLMYRPDVQDKILEELDRVVG RGRLPNLDDRRPHMPYTESCLRETMRIETLVPLNLPHRAQDITSLNGYNIP KNTMVLTNLWNIHSDIWDPEVFRPERFLDSRGLMLKKKDITLPGAGKR LCAGETFARQNMFLMFAQLMQUHYTFSPAPGKPKPPHGLSGFIISPKDWW IKYQVRY			XP_026470620
Big 1 NW_020538040 - QVAO01001886	-34084880 - 34072628	2	CYP304U1b	>Ctenocephalides_felis-1886-34084880-CYP304U1b MANPVIVFIAMVVFYWMYKLATERPKNFPPGPPRLPIWGSYWFILLANYTF FLQLAFTKIAKLYKSKIIGFYAGDFLGVAADQYETIKEILNKKEFDGRMDVIL ARMRDPKENLRGIFFTDGNFWHEQRRFALRYMRDFGFGRRCPSEAMINE ELNDLNLKNGPVEKDENVCRDGLIMPNIFFMAFINSFMAVFSRERWP RSKHHELKLRGAMVFORAGDDMGRALSQTPWLRHIIPEMSGYNDLKR GNKVIYEFIEKNVESIMKQHEGDDRSFVDIYLNEMTKRQKNIFNKDDETT FSVDQLITGADFLFPSTTALGVQLCYLFFHLMYRPDVQDKILEELDRVVG RGRLPNLDDRRPHMPYTESCLRETMRIETLVPLNLPHRAQDITSLNGYNIP KNTMVLTNLWNIHSDIWDPEVFRPERFLDSRGLMLKKKDITLPGAGKR LCAGETFARQNMFLMFAQLMQUHYTFSPAPGKPKPPHGLSGFIISPKDWW IKYQVRY			XP_026470621
Big 1 NW_020538040 - QVAO01001886	-34073391 - 34072628	2		exons 7 - 8 - 9	CYP340U1		
Big 1 NW_020538040 - QVAO01001886	-34093443 - 34092864	2		exons 8 - 9	CYP340U1		
Big 1 NW_020538040 - QVAO01001886	-34124327 - 34122218	2		exons 1 to 6	CYP340U1		
Big 1 NW_020538040 - QVAO01001886	-34130364 - 34129602	2		exons 7 - 8 - 9	CYP340U1		
Big 1 NW_020538040 - QVAO01001886	+49521350 - 49525914	mito	CYP12AL6	>Ctenocephalides_felis-1886+49521350-CYP12AL6 MFLSSKSLQSNVNLKNIKASVQKNIVHKYSTNLAEAVSIEDVLPYNKIP GPSTLPIIGAAHFAFGGKYSGLDLTLNRLYDEYGDIVCLRGLPSKPDV FIYNFEDMEKVYRNEGPWPERPALETREYLRREKRPEVFKSVYGLIHSQG EEWQKIRSVVNQPMQHKVTRQYVGVWIEEIANDFLARMKTLDDPEGNVP KDFQMEINKWSLESIAIAIDTRLGCLNPDYHSDGKILINSIQKFFQLGY QFEILPSFWKHKTLLKFKELMAYDDVTNIALKYSQARKRLEANPTNDQN NLSVLEKLLKDPQVAIIMALDMIFAGVDTTASSTITTYLNLAQNQDKQDNL RKHLSQLFPKGPITAEGLNSASYLKACFKESHMKPVVQANGRIAREDIV LQNYFIPKGTALFLTHDFSREKNQFPDWNKYMPELWRTETEGVPSAK CAHKFAYMPFGFGRMCVGRRAELEMVLTITDYKQWGTGAEMQY KSTMIQNPTGPMNFKLTPV			XP_026478421mN
Big 1 NW_020538040 - QVAO01001886	+49526329 - 49530194	mito	CYP12AL5	>Ctenocephalides_felis-1886+49526329-CYP12AL5 MFGLRSLVVLGNKAPCDLQKLLQNVVSKYSTNLAEAISFEDALSVDKI PGPSTLPIIGVAHFAFGGKYSGLDLAQLAEKLYKEYGDIVAIRGLPGKPD MVFLYNFDHMEKVYRTEGQWDRPAFESREYLRDKRPEVFKSVLGLLH SQGEEWQKIRSVVNQPMQHKVTRQYVGVWIEEIANDFIARLNTLLDKEGN VPEDFQMEMNKWSLESIAIAVDTLGLCFNPAPEHADGEKLIKAIQRFV LGYELEILPSFWKIETPKFKELIRYDDITDVALKYSQARKRLEANPTNDE ENLSILEKLLKDPQVAIIMALDMIFAGVDTTSSSTITTYLNLAQNQDKQDIL REHLGKVPKGPITAEGLNSIPYLKACFKESHRIKPVAVAGRLAGQDIVL GKYSIPKGSLLHDFSTRVKNQFPDWNKFLPERWLRTEGVPKCA HKFAYMPFGFGRMCVGRRAELEMVLTITDYKQWGTGAEMQYKST MIQNPTGPMNFKLTPV			XP_026478421mC

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 1 NW_020538040 - QVAO01001886	+49531849 - 49536377	mito	CYP12AL4	>Ctenocephalides_felis-1886+49531849-CYP12AL4 MFPSSRSIVVLSNKASREFLKQKLIQNVIVNKYSTNIAEAVSVKDALPYNKI PGPSTLPIIGVAHHFAPGGKYKGLDLAQLTEKLYEYGDIVAIRGLPGKPD VFLYNFDHMEKVYRTEGPWDRPAFESREYLRERPEVFKSVYGLIHSQ GEEWQKIRSVVNPMMQHKITRQYVGVWIEEIANDFIARMKTRLDKEGNV EDFQMEMNKWSLESIAIAVDTRLGCFNPDAREHADGEKLINALQKFFVL GYEIEILPSFWKYIKPKFNELMQVYDDITEVALKYISQAMKRLETNPSSDE ENLSVLEKLLKQDPQVAIIMALDMFFAGVDTTSSSTITTYLNLAQNQDKQDIL REHLGKVFPGKSPITAEGLNIPYKACFKESHRIKPAQGVGRVAVQDQDIL GKYIIPKQKALFLLHDFSSRVKNQFPDWNKFLPERWLRTEGVPKAKCA HKFAYMPFGFGRMVCVGRFAELEMEVLVSRITDYKVVHWTGAEMQYKN TMIQNPTGPMNFKFTPV			<b>XP_026462561</b>
Big 1 NW_020538040 - QVAO01001886	+49538507 - 49544297	mito	CYP12AL7	>Ctenocephalides_felis-1886+49538507-CYP12AL7 MLNSAKCFQLLNLKSGTKQHLPLCAVNIERYANGAVPKASNEALPFE KMPGPSALPDGTMHFAKGGQYHGMDDLKSVKLYEDFGDIVSVKGV GKYDMVFLYNFDDMEKVYRTEGPWPSRPNIETREHYLRERPELKNIVG LFHAQKQDWQDIRSKVNPMMQTKITKQYVGVWIEEIANDFITRLMLFGLD EKGNAEEDFMTEVKNWSLESIAIAIDSRGLDADLPEESDGIKLRSM KFFELAYETDLLPSNWKLETPKYKELIEYDVTDAVKHISAQVAVKRETN TSDDSNLSILEKLLKIDYQVAIIMALDMFFAGIDTTSSSTVTTYLNLAQN QKRLREELNKVFPKGTITSEGLNDSPLYKACIKESLRKPAVAVANGRLAAE DMVLGGYINPKGTALMMFHHLAAVLKNQFPDKDFLPERWLRSGPDSVP DAKCAHKFAYLPFGFGRMVCVGRFAELEMEILIAKLVNTYHIEWSGPDM EYRTTMTAPTAMRFKFTPTN			<b>XP_026478429</b>
Big 1 NW_020538040 - QVAO01001886	+49545280 - 49549488	mito	CYP12AL2a	>Ctenocephalides_felis-1886+49545280-CYP12AL2a MHKGIIRLLITRINRKFSTGYVVKRQIVSEVSALSYDKIPGPSALPIIGTLH LPGGKLSGLNMLDLGLKLYEDYGDIVKLGMPGKEDMVYDLDIAEKVY RTEGWSVPRPGLREHYIKRPEIFKSVYGLLHSHGEEWQNIQRTKVNQ PMMQIKVTRQYVGVWIEEIANDFIKRLQTLDAEGNVPQNFLEVDWRSLE SIARIAVDTRLGCLDDNLAEDSDGMKLIQTLQRFDDLAYEIEILPSFWRYINT PKYKEMMQIFDCFTDIAIKHVSKAIKRLSNPTTDESNSVLEKLLKIDPQV ALVMALDMFFAGVDTTASSTISALYFLAKNPEKQKLRSELRAIFPNNAPIT AEGLNSSSYLKACFKETHRLKPVAVGNMRHAGTDIVLGGYFIPKGTIVML YHHLAAKVKVQFPDSDKYLPERWLRTPGSVPPAKSAHKFAYMPFGFGR RMCVGRFAELEMEVLVTRITNYQIDWNGPDMQYKSSILGPTGPMRFR RLTSIK		frameshift at X, but TSA GAYP02015753 shows X=R	XP_026478439
Big 1 NW_020538040 - QVAO01001886	+49550522 - 49553584	mito	CYP12AL1bP	>Ctenocephalides_felis-1886+49550522-CYP12AL1bP MHKEIRLLITKINRKFSTGYVVKRQIVSEVSALSYDKIPGPSALPIIGTLH LPGGKLSGLNMLDLGLKLYEDYGDIVKLGMPGKEDMVYDLDIAEKVY RTEGWSVPRPGLREHYIKRPEIFKSVYGLLHSHGEEWQNIQRTKVNQ PMMQIKVTRQYVGVWIEEIANDFIKRLQTLDAEGNVPQNFLEVDWRSLE SIARIAVDTRLGCLDDNLAEDSDGMKLIQTLQRFDDLAYEIEILPSFWRYINT PKYKEMMQIFDCFTDIAIKHVSKAIKRLSNPTTDESNSVLEKLLKIDPQV ALVMALDMFFAGVDTTASSTISALYFLAKNPEKQKLRSELRAIFPNNAPIT AEGLNSSSYLKACFKETHRLKPVAVGNMRHAGTDIVLGGYFIPKGTIVML YHHLAAKVKVQFPDSDKYLPERWLRTPGSVPPAKSAHKFAYMPFGFGR RMCVGRFAELEMEVLVTRITNYQIDWNGPDMQYKSSILGPTGPMRFR LTIPIK		<b>Pseudogene:</b> three frameshifts at X, no supporting TSA seq	XP_026478449
Big 1 NW_020538040 - QVAO01001886	+(49612358) - 49616253	mito	CYP12AL2b	>Ctenocephalides_felis-1886+(49612358)-CYP12AL2b MYKGIIRLLITKINRKFSTGYVVKRQIVSEVSALSYDKIPGPSALPIIGTLH LPGGKLSGLNMLDLGLKLYEDYGDIVKLGMPGKEDMVYDLDIAEKVY RTEGWSVPRPGLREHYIKRPEIFKSVYGLLHSHGEEWQNIQRTKVNQ PMMQIKVTRQYVGVWIEEIANDFIKRLQTLDAEGNVPQNFLEVDWRSLE SIARIAVDTRLGCLDDNLAEDSDGMKLIQTLQRFDDLAYEIEILPSFWRYINT PKYKEMMQIFDCFTDIAIKHVSKAIKRLSNPTTDESNSVLEKLLKIDPQV ALVMALDMFFAGVDTTASSTISALYFLAKNPEKQKLRSELRAIFPNNAPIT AEGLNSSSYLKACFKETHRLKPVAVGNMRHAGTDIVLGGYFIPKGTIVML YHHLAAKVKVQFPDSDKYLPERWLRTPGSVPPAKSAHKFAYMPFGFGR RMCVGRFAELEMEVLVTRITNYQIDWNGPDMQYKSSILGPTGPMRFR LTIPIK		N-term from TSA: GAYP02015753	XP_026478499
Big 1 NW_020538040 - QVAO01001886	+49617221 - 49620341	mito	CYP12AL1a	>Ctenocephalides_felis-1886+49617221-CYP12AL1a MHKEIRLLITKINRKFSTGYVVKRQIVSEVSALSYDKIPGPSALPIIGTLH LPGGKLSGLNMLDLGLKLYEDYGDIVKLGMPGKEDMVYDLDIAEKVY RTEGWSVPRPGLREHYIKRPEIFKSVYGLLHSHGEEWQNIQRTKVNQ PMMQIKVTRQYVGVWIEEIANDFIKRLQTLDAEGNVPQNFLEVDWRSLE SIARIAVDTRLGCLDDNLAEDSDGMKLIQTLQRFDDLAYEIEILPSFWRYINT PKYKEMMQIFDCFTDIAIKHVSKAIKRLSNPTTDESNSVLEKLLKIDPQV ALVMALDMFFAGVDTTASSTISALYFLAKNPEKQKLRSELRAIFPNNAPIT AEGLNSSSYLKACFKETHRLKPVAVGNMRHAGTDIVLGGYFIPKGTIVML YHHLAAKVKVQFPDSDKYLPERWLRTPGSVPPAKSAHKFAYMPFGFGR RMCVGRFAELEMEVLVTRITNYQIDWNGPDMQYKSSILGPTGPMRFR LTIPIK			XP_026478509
Big 1 NW_020538040 - QVAO01001886	-51177970 - 51172862	mito	CYP12AL3b	>Ctenocephalides_felis-1886-51177970-CYP12AL3b MGYKRLGLGIRFLYNSVHTKNYCTNVTEMNSAKSVLPFNKVPGPSTLP VIGTLHHFLPGGSYNGLDLVDLGLKLYDDFGDIVNLKGMGLGKQDMVFLYDL DDFEKIYRTEGAWPERSTVATREYLLKVRREPEVFKSVYGLIHSQKQEWQD IRTAVNQIMMOMKTARQYVGVWDEIALDFIKRLETLLDSERKVPKDFLYEM DRWSMESIARIAIDTRLGCLDLHQPENADGFRLIKLSRYFDLAYQVEILPS MWKYVSTPKFNEIMDFDCFTSISIKHIKAIKREENPTIDESNSVLEKLL KIDPQIAIIMALDMFFAGVDTTSSSTSLSTLYFLSKNPKQDRLEEVNSKFP RGSTLTAEGNLSYLKACIKETQRLKPIAVGILRNTGADLVLGGYSVPKGT QVLMCHHLAARVKKQFPDEHKYMPERWLRAGSEGFPSAQCAHKFSYMP FGFGRMVCVGRFAELEMEVLVTRITNYRHLHWTGPDQYKSTLITGPIGP FGLHLNPI			<b>XP_026478767</b>
Big 1 NW_020538040 - QVAO01001886	+51213217 - 51217494	mito	CYP12AL3a	>Ctenocephalides_felis-1886+51213217-CYP12AL3a MGYKRLGLGIRFLYNSVHTKNYCTNVTEMNSAKSVLPFNKVPGPSTLP VIGTLHHFLPGGSYNGLDLVDLGLKLYDDFGDIVNLKGMGLGKQDMVFLYDL DDFEKIYRTEGAWPERSTVATREYLLKVRREPEVFKSVYGLIHSQKQEWQD IRTAVNQIMMOMKTARQYVGVWDEIALDFIKRLETLLDSERKVPKDFLYEM DRWSMESIARIAIDTRLGCLDLHQPENADGFRLIKLSRYFDLAYQVEILPS MWKYVSTPKFNEIMDFDCFTSISIKHIKAIKREENPTIDESNSVLEKLL KIDPQIAIIMALDMFFAGVDTTSSSTSLSTLYFLSKNPKQDRLEEVNSKFP RGSTLTAEGNLSYLKACIKETQRLKPIAVGILRNTGADLVLGGYSVPKGT QVLMCHHLAARVKKQFPDEHKYMPERWLRAGSEGFPSAQCAHKFSYMP FGFGRMVCVGRFAELEMEVLVTRITNYRHLHWTGPDQYKSTLITGPIGP FGLHLNPI			XP_026478811

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 1 NW_020538040 - QVAO01001886	-79837933 - 79833382	mito	CYP302A1a	>Ctenocephalides_felis-1886-79837933-CYP302A1a MIRLKKQFSYKSFVLRNELSTSSVKEPRPFNEIPGPKPIVGLTLWMYW PIIGKYRWSALHHTGMKKYKTWGLIREPVAPGVTLWVYEPDDITILRD EGQNFPPERRSHLALQKFREDRPHVYNSGGLLPTNGAEWWKLRSEFQK GLSAPHCARQFFKSADQITSEFCHHINEIASDCKDFLPEISRLNLELVYMA FDTRMNSFSKEELDSHSRSSLKAAEDTNSCILGTDQIGLWKFIFTLKY KKLERAQKYMESVAVDLVSQKFSYTDATAESGSKSLENIYINPKLDFR DIIGMAADLLLAGVDTTSYATSFALYHLAINPHVQEELYEESLKILETKNSPM TLESFQNASYARAVLKESSLRNLPISVGVGRIKKDITLSGYHIPAGTVAVTQN QVICRLEKNFPEADKFLPERWLKSNKSVSRMRNKDSQNFTEINKFDIKD TFQVPHFPLSLPFGYGMRSVARRFAEQNIQVLLLRILRNFEISWGGTTLD SKTFLINKPDQPLNFKFRLRSN			XP_026472405/ XP_026471143
Big 1 NW_020538040 - QVAO01001886	-79848331 - 79843466	4	CYP4191A3b	>Ctenocephalides_felis-1886-79848331-CYP4191A3b MYLTLVLSILVICLMKWRNTRSSLYRIANKFDGPALYPIIGNALLFAGPRKE ILNKIHIHTEYSSPIRLWFAHRLLLVFTDADQVEKILLSKLYKDAIYDPIK AMVGDGLITGSGVRRARLHRKILSPMLSPKNINGYIDIFEKHTEVYIKQLEEK ADGQEFDIYWTMSRLCSDIVFDSIMDYKLSKQETEEFLSNVEFLYDVVIER LVKIWMQTDALFKLSPIAKRYYSINVINFFKLLKTKQEELKAGITSEKAN KSPSTVEQLLRFANDPDAYTDKEILDEILTYAAAQDITASCSFVLMILGA YPEAQEKLYQEVNQVHFNRNTAMTTADIAQLTYTDMVIKEVIRLFIAPFLV RTCSSEVPIDDITIPANCSVVLGIFDLHHQSKHWEHPWEFYPEHFLPVTV ASRHPSAYLPFSYGKRSCLGKTYALSLIKVAVARIVQRFKIVADKKVQDLHL HNDISVRSTDGKIKLLRE			<b>XP_026471144</b>
Big 1 NW_020538040 - QVAO01001886	-79859575 - 79853951	4	CYP4191A3a	>Ctenocephalides_felis-1886-79859575-CYP4191A3a MYLTLVLSILVICVMKWRNSRSLYRIANKFDGPALYPIIGNALLFAGPRK EILNKMIKIHTYRSPPIRLWFAHRLLLVFTDADQVEKILLSKLYKDAIYD LKVMDGLITGSGIRARLHRKILSPMLSPKNINGYDIFEKHTEVYIKQLEEK EKADGQEFDIYWTMSRLCSDIVFDSIMDYKLSKQETEEFLSNVEFLYDVVIER ERLVKIWMQTDALFKLSPIAKRYYSINVINFFKLLKTKQEELKAGITSEK ANKSPSTVEQLLRFANDPDAYTDKEILDEILTYAAAQDITASCSFVLMIL GAYPEAQEKLYQEVNQVHFNRNTAMTTADIAQLTYTDMVIKEVIRLFIAPY LVRTCSSEVPIDDITIPANCSVVLGIFDLHHQSKHWEHPWEFYPEHFFPE AVANRHPSAYLPFSYGTRSCGLGKTYALSLIKVAVARIVQRFKIVADKKVQDL HLHNDISVRSTDGKIKLLRE			XP_026471145
Big 1 NW_020538040 - QVAO01001886	-92260357 - 92249572	3	CYP9FF2	>Ctenocephalides_felis-1886-92260357-CYP9FF2 MIFALVVGGLILGVLVYAGTWNKYFEKLGIPYVVPVWLGNTSDFVFRQ TSLMDFIANLHKAFDRKFIGVYFRNPVIVLNDPELIKQITVKDFDFHIDHR FTIDPNVEPMFGRNLVSIKGNKWRMRATLSPAFTGSKMRNMFLVTECA EELIKYLNLESKDRTIEMKDLFRYANDVIASAAFGLKVDLREPNNEFYV MTKEISLFRGIQALKFFGFTAFPKLMKFLNIQMGFPRIQKFYRNLVMDTMK QRDEQNVIRPDMIHLLMQVROGTLKHEEVVDTKDAGFATVTESEIGKSSN NITHWEDDLDTAQAVIFLAFAGFETSSTLMCFVCHELALQPEIQKQLQTEIDQ VRSNNKITYEVIQSMKYLDMVISLRLWPPGIFLDRMCKVYPYIVDEDN NVKIDLKPGDGVVAVSGIHRNPKYYPNPTDFPERFSDSNKSSIDPYAYL PFGAGPRNCIGSRFALMEVKALVFYILESFLEPCYKTIPLKLCCTSANPT AKGGFWLDFKLRQKPMN			XP_026474278
Big 1 NW_020538040 - QVAO01001886	-92279074 - 92265046	3	CYP9FF1	>Ctenocephalides_felis-1886-92279074-CYP9FF1 MSVALTVGGLILGVLVYAGTWNKYFEKLGIPYVVPVWLGNTSDFVFRQ QNSLLDMLVDLYNKFPDSKICGIFEFNRNPVIVLNDPELIKQITVKDFDFHIDHR RVKIDEVIEPMFGRNLVSIKGNKWRMRATLSPAFTGSKMRNMFLVTECA CAEDLVKYLETLNESERTLELKDLYRFTNDVIASAAFGLKVDLREPNNEFYV FYLMTKEISNFGGLRAFKFFGYTSFPRMLKLFKVMFQPEIQQFYRGLVQ DTMKMRDRENITRPMIQLLMQVRKGTLLKHEDTPDVKDAGFATVTESTV GKATNNRIWEDDDLAQAVALFLVAGFDTSSSTLMCFVCHELALQPEIQKQLQ DEIDEVRAENKVTYDIIQMKYLDMVISLRLWPPGIFLDRMCKVYPYIVDEDN DPDTNARIELKPGDGVVAVSGIHRNPKYYPNPTDFPERFSDSNKSSIDPYAYL PFTYLPFGVGRSCIGSRFALMEKALLFFILSSFTIEPCAQTQIPIKLSAQS GNVTAEKGFVYFRPRKATN			<b>XP_026474277</b>
Big 1 NW_020538040 - QVAO01001886	-105674578 - 105660934	4	CYP4VD1	>Ctenocephalides_felis-1886-105674578-CYP4VD1 MLAILTSVLFLLFFLTLHYGFKELAQVRKVENVPAVRPFVFGNIFDIIMT PSELDFFGRHLARKYKRFYRLWILQDSFINLLKPEDIEALLSNIKHKKSRIY DQITPWLKEGLLTSYGSKWQSRKILTPAFHFNLQQFVQVFGHEHKSRLVS QLEIECQKQDSTVNSIMADVALNNICETAMGTNLKAVIDSIDSIDYKCSIFRW SQLFVYRLQRYWHPAVIYNLTPMGYQMRKVLKNLHSTFKGIITDRKKKLM TNVSLNAKTSDEDEKDEFHVKKRMAMLDLLLSAEARGENIDENGIHEEVD TFTFEGHDTTSMGLIFTLTSLADNPVQRKAYEEIAEVFGEDEMPATIQDL QKLTYLDRCIKETLRLYPSVPIFISRDLEPLDLDVDCRIPAGQIIVHIFDLHRD PDIYPNPEMDFDRFLPEEAKRHPFAYIPFSAGPRNCIGQKFALELKS VSTILRHYTEAITKPKDLIFVIDIILRTDHPKIKFRKRRL			XP_026473020
Big 1 NW_020538040 - QVAO01001886	+ 105695114 - 105707680	4		exons 2 to10, exon 6 with frameshift and deletion	CYP4VD1		XP_026471354
Big 1 NW_020538040 - QVAO01001886	+105725631 - 105768643	4	CYP4VE1	>Ctenocephalides_felis-1886+105725631-CYP4VE1 MDLVTISFAALMILCLLHFLIEKKNCAESLKDIPGPRAYPIIGNFLDYGD QAKLFSSLRKWKALYKPIYKTRVMAISIVCLLRPEDIEVLLSSMRHIKKS DFLHPWLQDGLLTSYGSKWQSRKILTPAFHSTVLQEFCAVFGQGNALAE ERLADECDRQETDICYVTDALHSICETAMGTLEIANDVSWQYKNAIYR MGELLVHRLVRLPWLPMCLFALSPSGMEQRRVVSTLHSTGDVIRKRKM DFIGQTPQLPVVPAHKRRLAMLDLLLSAEHEGADIDELGIREVDTFMFEG HDTVSMIAIFLCLANNPEYQDKAYQECCQIFGNSDRVPTIPDLNEMRFL ERICESLRLYPSVPLISRALTEPLVKDRIPAGQIVHIFDLHRDPLFPD PERYDPRFLPEEAKRHPFAYIPFSAGPRNCIGQRFALYEDKSVISTVLR KYKLEAITKNEVIFNADLVLRPKYPIKIRFRHRSANHTKRNEMNR			<b>XP_026473019</b>
Big 1 NW_020538040 - QVAO01001886	+ 105791300 - 105791136	4		exon 1	CYP4VE1		XP_026471356
Big 1 NW_020538040 - QVAO01001886	-105817956 - 105803628	4		exons 2 to 10, frameshifts in exons 2 and 7,	CYP4VE1		XP_026471358
Big 1 NW_020538040 - QVAO01001886	+106050241 - 106058223	4		exons 4 to 10, 2 frameshifts in exon 4	CYP4VD1		XP_026473021
Big 1 NW_020538040 - QVAO01001886	-117330012 - 117329584 (exon 2) / +117431311 -117432414 (exon 1)	3	CYP6WP4P	>Ctenocephalides_felis-1886 +117431311-CYP6WP4P MFDLNLHFWLVLVFLFALGTTYLWMRNKFYWTYKYNIDSLTPTFFPFGNFG PMMVGGKESIGMSVQKTYNACKNSGKYCYFLFGTGPLVVTDPEAIKIMV KDFQFFHDRGIFYNEKHDPISANLFAIEGDKWRKLRKLSPTFTSGKLT FYTMLESVSELMYIQAISQSELEIKDILARFTTDIIGSCALGIQCNSLKN PKAEFREIGEKIMTPSIWQTIKGAFAFTFRFARHLRIVTNDSEVSHFFLHT VQNTIRYRKNNNIERYKFMQLLLKLDKDDNTNGDSDSQTSLTMEIEAAQAFIF FLGGFETSSAMSFCLFELALNPEIQTRARDEINRVNTNKNKSGKISYEALVE MVYLDMAISETLRKYPTLPVLRNRECVKDYKLPATETIIPRGTPFIPVAGLHH DPEIYPEPDKFDPERFNEENKAKRHNFAYLPG*GPRICIGMRFGMMQTR LGLITLIKDYEIKCAKTNIPKIDPKSLTTCIGGIWLRFDPI		<b>Pseudogene:</b> second exon inverted at MAIS/ETLR and stop codon(*) ; no TSA support	XP_026471516

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 1 NW_020538040 - QVAO01001886	+140809891 - 140818537	2	CYP307B1	>Ctenocephalides_felis-1886+140809891-CYP307B1 MDYDNFYQIAAYNIGVRTATAYLFGVALLLIASILRSIIQSNKETESNGELNK SEYQDLRDMPGPKPMLIIGNLHQLKQADEPPYAAFTRLAKTYGPVYKLE MGAIKCAVVNELENMREVLIAKGNHFDGRPNFWRKYEIFSGDKENSLAFC DWSDVQKSRREMLRAHTFPRTYSARGVEMDGLIGEQTIMSKIIQESDK DSPLPIKPLLLQTCANIFTRYFCSRSFDFHGEFQNTVEDFDEIFYEVNQG YAADFLPFLSPLHEKMRMDIKVKSRIIRDVLEEIIIGDRFENWPKGDTQND YVDSLVEYVRGEGTPALSWDMLFALEDILGGHSAIGNLMVKVLGYVACR QDVQNMQQEVDNAIGQEDSCRRPGLTDRVNMPYTEAVILEAIRLIASPIV PHVANKDSAIAGYKVEKGTILFLNHYHLNMSPELWDEPESFKPERFLRSG RLVKPEHFLPFGGRRSCMGYKLVQWCSHAILANLMDFTIQPVEGDLYK VPVGNLAMPKDSFRFRFLARSGQT			<b>XP_026471719</b>
Big 1 NW_020538040 - QVAO01001886	-166576060 - 166574126	3	CYP6WM1c	>Ctenocephalides_felis-1886-166576060-CYP6WM1c MDFNIYSSLLLLLIGISIIYVNHALYWSSRKVPTLWPLPFVGNFKDFVL MKNSPGEFVMSFYKTKKPKILGIFVSRPSLFIKDPVSWIKSILVKDFNMFQ DRVSSTDGHTDALGSRNLFRIKNPLWKEMRVKLTPIFSTAKMKSMPFLITQ VGEEFNEFMNTTLKRNIDNMRDLCAKYTTDVTSCAFGIQANSFKNPDA EFRTVGRIFAAEYKRAIEISAFFFPVVSILGFKLFEKYGTFLRQSFNEV LGERIKSGTSRHDLDMLIDLKNEAASGSLKFEGDTLVAQAAVFFAAGYE ASSGAMSTLYEIALQPEIQHRLRAEILEKINEHGGITYEAIKEMKYLDMLVLS ETLRKYPTLPFLDRMCTSRYLPPPYDHHVLEPKTPIYLSILAIHMDPKYYP NPKDFPERFSEDMKQNRNPYTYMPFGAGPHNCIGERFGLLQTKVGLAY ILKDFHFTPEKTRVPLQLDSKAMFLAPKGGIHLQFERI			XP_026474636
Big 1 NW_020538040 - QVAO01001886	-166593856 - 166911503	3	CYP6WM1a	>Ctenocephalides_felis-1886-166593856-CYP6WM1a MDFNIYSSLLLLLIGISIIYVNHALYWSSRKVPTLWPLPFVGNFKDFVL MKNSPGEFVMSFYKTKQEPILGIFVSRPSLFIKDPVSWIKSILVKDFNMFQ DRVSSTDGHTDALGSRNLFRIKNPLWKEMRVKLTPIFSTAKMKSMPFLITQ GEEFNEFINTTLKRNIDNMRDLCAKYTTDVTSCAFGIQANSFKNPDAEF RTVGRIFAAEYKRAIEISAFFFPVVSILGFKLFEKYGTFLRQSFNEV ERIKSGTSRHDLDMLIDLKNEAASGSLKFEGDTLVAQAAVFFAAGYEAS SGAMSTLYEIALQPKIQHRLRAEILEKINEHGGITYEAIKEMKYLDMLVLS ETLRKYPTLPFLDRMCTSRYLPPPYDHHVLEPKTPIYLSILAIHMDPKYYP NPKDFPERFSEDMKQNRNPYTYMPFGAGPHNCIGERFGLLQTKVGLAY ILKDFHFTPEKTRVPLQLDSKAMFLAPKGGIHLQFERI			XP_026471899
Big 1 NW_020538040 - QVAO01001886	+166909611 - 166911500	3	CYP6WM1b	>Ctenocephalides_felis-1886+166909611-CYP6WM1b MDFNIYSSLLLLLIGISIIYVNHALYWSSRKVPTLWPLPFVGNFKDFVL MKNSPGEFVMSFYKTKQEPILGIFVSRPSLFIKDPVSWIKSILVKDFNMFQ DRVSSTDGHTDALGSRNLFRIKNPLWKEMRVKLTPIFSTAKMKSMPFLITQ GEEFNEFINTTLKRNIDNMRDLCAKYTTDVTSCAFGIQANSFKNPDAEF RTVGRIFAAEYKRAIEISAFFFPVVSILGFKLFEKYGTFLRQSFNEV ERIKSGTSRHDLDMLIDLKNEAASGSLKFEGDTLVAQAAVFFAAGYEAS SGAMSTLYEIALQPKIQHRLRAEILEKINEHGGITYEAIKEMKYLDMLVLS ETLRKYPTLPFLDRMCTSRYLPPPYDHHVLEPKTPIYLSILAIHMDPKYYP NPKDFPERFSEDMKQNRNPYTYMPFGAGPHNCIGERFGLLQTKVGLAY ILKDFHFTPEKTRVPLQLDSKAMFLAPKGGIHLQFERI			
Big 1 NW_020538040 - QVAO01001886	-167617190 - 167592569	mito		exons 1 to 3	CYP301A1		
Big 1 NW_020538040 - QVAO01001886	+167829001 - 167852472	mito	CYP301A1	>Ctenocephalides_felis-1886+167829001-CYP301A1 MSAPSMQCARYLHTAGRRGAHVASIAAPSAEQTFahalPYSRVPGRPRP PLLGNTWRLLPIIGQYQISDIARVSEIFYEKYGRIVRLGGLGRPDLLFVYDA DEIEKYVRNEGPTPFRPSMPCLVHYKGVVRKDFFGDLPVGVVHGEQW REFRSRVQRPVLRPATVRKYVAPLEQVTEDFIDRCNGLLDNKSELDDFD NEIHKWSLECIQRVALDTRLGCLSSDLKTNSEPQRIIDGAKYALRNVALLE KAPFWRYIRTPLWTKYVQNMDFVEICMKYIERSAITLQEKKTRCPASDE EPSLLERVLNENSDPKIACIMALDLILVIGDITISMAVCSILYQLSTRQAEQK LHKELVKVLPDPNPTLPQLLDQMHYKAFIREVFRVYSTVIGNRGLTQND EVICGYHIPKGVQVFPVVTGNMEEYVKDASVFKPERVWMSQGNIDS EIHFPASLPYGYGARMCLGRRFADLEMQLLAKLIRSYKLEYHHDPLKYAVT FMYAPDGPLKFKMTPRD			<b>XP_026471917</b>
Big 1 NW_020538040 - QVAO01001886	+176695509 - 176697742	3	CYP6WM3a	>Ctenocephalides_felis-1886+176695509-CYP6WM3a MDLINVLLLLLITFIGTFIYYNYSTYWSSKGIASFRPLPFLGNFKDVALAKIN SGLFMKSLYDKTKASALGIYVFNKPSLLIRDPEWIKTILVKDFNYFHDRIVAL DGSDTLGKTNLFSIKNPDWQMRVKLTPIFTSGKMKMNFHLMNDEGKIL NEYLHKLADSKEPSDNARELSARYTTDVIATCAYGIKANCNMNPEAEFRSI GRKIFEVSLRRVLELGSFFFFPRVNLGLKFAHEGTEFIRNTFNETIRIRE ESKTKRHDLDVLDLIDLNQAQAPGEIRFDGDTLVAQAAVFFTAGFETSSST MSYSLYELALNPDIQEKLRAEIKEILDEDDITYESINKMSYLDMVISETLRKY PPLAFLDRKVADNSTGYRLPKPHDDVILEPGTPIYIPMLAVHMDPEYFPDP EKFDPERFTDEAKRNRIPTYFPFGTGPRNCIGERFGLLQTKLGLVHMLK DFTVHPCADTPSKITFTPLSFLTPKDTINLKFLRA			XP_026473518
Big 1 NW_020538040 - QVAO01001886	+176701325 - 176705092	3	CYP6WM2d	>Ctenocephalides_felis-1886+176701325-CYP6WM2d MDLINVLLLLLITFIGTFIYYNYSTYWSSKGIASFRPLPFLGNFKDVALAKIN VNSGIFMKSLEYERTKAPALGMYVFNKPSLLVRDPEWIKTILVKDFNYFHDRIVAL VAVAGDGLTGKTNLFSIKNPDWQMRVKLTPIFTSGKMKMNFHLMNDEGKIL RNLNEYLHKLADSKEPSDNARELSARYTTDVIATCAYGIKANCNMNPEAEFRSI RSIGRKIFEVSRFRVLELGSFFFFPRVNLGLKFAHEGTEFIRNTFNETIRIRE REESKTKRHDLDVLDLIDLNQAQAPGEIRFDGDTLVAQAAVFFTAGFETSSST TMSYTYELAINPDVQKLRAEIKEIADDDITYESINKMSYLDMVISETLRKY PPLAFLDRKVADNSTGYRLPKPHDDVILEPGTPIYIPMLAVHMDPEYFPDP PEKFNPERFTDEAKRNRIPTYFPFGTGPRNCIGERFGLLQTKLGLVHMLK KDFTVHPCADTPSKITFTPLSFLTPKDTINLKFLRA			<b>XP_026473516</b>
Big 1 NW_020538040 - QVAO01001886	+176708820 - 176711051	3	CYP6WM3b	>Ctenocephalides_felis-1886+176708820-CYP6WM3b MDLINVLLLLLITFIGTFIYYNYSTYWSSKGIASFRPLPFLGNFKDVALAKIN SGLFMKSLYDKTKASALGIYVFNKPSLLIRDPEWIKTILVKDFNYFHDRIVAL DGSDTLGKTNLFSIKNPDWQMRVKLTPIFTSGKMKMNFHLMNDEGKIL NEYLHKLADSKEPSDNARELSARYTTDVIATCAYGIKANCNMNPEAEFRSI GRKIFEVSLRRVLELGSFFFFPRVNLGLKFAHEGTEFIRNTFNETIRIRE ESKTKRHDLDVLDLIDLNQAQAPGEIRFDGDTLVAQAAVFFTAGFETSSST MSYSLYELALNPDIQEKLRAEIKEILDEDDITYESINKMSYLDMVISETLRKY PPLAFLDRKVADNSTGYRLPKPHDDVILEPGTPIYIPMLAVHMDPEYFPDP EKFDPERFTDEAKRNRIPTYFPFGTGPRNCIGERFGLLQTKLGLVHMLK DFTVHPCADTPSKITFTPLSFLTPKDTINLKFLRA			XP_026471994

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 1 NW_020538040 - QVAO01001886	+176714851 - 176718623	3	CYP6WM2c	>Ctenocephalides_felis-1886+176714851-CYP6WM2c MDLINIFLLLLTFVGTFIYYHYSYSTYSSKGIASFRPLPFVGNFKDVLAKV NSGVFMKSLYERTKAPALGMYVFNKPSLLVRDPEWIKTILVKDFNFFYDRIV AVAGDGLTGTGNLFSIKNPDWKQMRVKLTPIFTSGKMKSMFHLMNDEG RNLNEYLHKLADSKQPSDNARELSARYTTDVIATCAYGIKANCMMNPEAE FRSIGRKIFEVSFRVFEASSFFFFPRIVSLLGLKFFAHEGTEFIRNTFNETI RIREESKTRHDLVDLIDLKNAKTAPGEIEFDGDTLVAQAAVFFTAGFETS SSTMSYTYELAINPDVQKLRRAEIKEIVAEDDITYESINKMSYLDMVISSETL RKYPPLAFLDRKVVDNSNGYRLPKPHDDVLEPGTPIYIPMLGLHMDPEY FPDPEKFNPERFTDEAKRNXPITYYFPFGTGPRNCIGERFGLLQTKLGLVH MLKDFTVHPCADTPSKITFTPLSFLLPKDTINLKFLRA		frameshift at X, but TSA GAYP02011470.1 shows X=R	
Big 1 NW_020538040 - QVAO01001886	+176722340 - 176724574	3	CYP6WM3c	>Ctenocephalides_felis-1886+176722340-CYP6WM3c MDSINVLILLITFIGTFIYYNYSTYSSKGIASFRPLPFLGNFKDVALAKI NSGLFMKSLYDGTKASALGIYVFNKPSLLIRDPEWIKTILVKDFNFFHDIRVA LDGSDTLGTGNLFSIKNPDWKQMRVKLTPIFTSGKMKMNFHLMNDEGKI LNEYLHKLADSKQPSDNARELSARYTTDVIATCAYGIKANCMMNPEAEFRS IGRKIFEVSLRRVLELGSFFFFPRVNVLLGLKFAHEGTEFIRNTFNETIRIR EESKTRHDLVDLIDLKNAQTAPGEIRFDGDTLVAQAAVFFTAGFETSST MSYSLYELAINPDVQKLRRAEIKEILDEDDITYESINKMSYLDMVISSETLRKY PPLAFLDRKVDNSTGYRLPKPHDDVLEPGTPIYIPMLAVHMDPEYFPDP EKFDPERFTDEAKRNRIPTYFPFGTGPRNCIGERFGLLQTKLGLVHMLK DFTVHPCADTPSKITFTPLSFLLPKDMINLKFLRA			XP_026471995
Big 1 NW_020538040 - QVAO01001886	+176728123 - 176731880	3	CYP6WM2b	>Ctenocephalides_felis-1886+176728123-CYP6WM2b MDLINIFLLLLTFVGTFIYYHYSYSTYSSKGIASFRPLPFVGNFKDVLAKV NSGVFMKSLYERTKAPALGMYVFNKPSLLVRDPEWIKTILVKDFNFFYDRIV AVAGDGLTGTGNLFSIKNPDWKQMRVKLTPIFTSGKMKSMFHLMNDEG RNLNEYLHKLADSKQPSDNARELSARYTTDVIATCAYGIKANCMMNPEAEFRS FRSIGRKIFEVSFRVFEASSFFFFPRIVSLLGLKFFAHEGTEFIRNTFNETI RIREESKTRHDLVDLIDLKNAKTAPGEIEFDGDTLVAQAAVFFTAGFETS SSTMSYTYELAINPDVQKLRRAEIKEIVAEDDITYESINKMSYLDMVISSETL RKYPPLAFLDRKVVDNSNGYRLPKPHDDVLEPGTPIYIPMLGLHMDPEY FPDPEKFNPERFTDEAKRNRIPTYFPFGTGPRNCIGERFGLLQTKLGLVH MLKDFTVHPCADTPSKITFTPLSFLLPKDTINLKFLRA		frameshift at X, but TSA GAYP02011470.1 shows X=K	
Big 1 NW_020538040 - QVAO01001886	+176744110 - 176746372	3	CYP6WM3d	>Ctenocephalides_felis-1886+176744110-CYP6WM3d MDLINVLILLITFIGTFIYYNYSTYSSKGIASFRPLPFLGNFKDVALAKIN SGLFMKSLYDGTKASALGIYVFNKPSLLIRDPEWIKTILVKDFNFFHDIRVAL DGDSDTLGTGNLFSIKNPDWKQMRVKLTPIFTSGKMKMNFHLMNDEGKIL NEYLHKLADSKQPSDNARELSARYTTDVIATCAYGIKANCMMNPEAEFRS GRKIFEVSLRRVLELGSFFFFPRVNVLLGLKFAHEGTEFIRNTFNETIRIRE ESKTRHDLVDLIDLKNAQTAPGEMRFDDGDTLVAQAAVFFTAGFETSST MSYSLYELAINPDVQKLRRAEIKEILEDDITYESINKMSYLDMVISSETLRKY PPLAFLDRKVDNSTGYRLPKPHDDVLEPGTPIYIPMLAVHMDPEYFPDPE KFDPERFTDEAKRNRIPTYFPFGTGPRNCIGERFGLLQTKLGLVHMLKD FTVHPCADTPSKITFTPLSFLLPKDTINLKFLRA			XP_026471996mN
Big 1 NW_020538040 - QVAO01001886	+17675017 - 176753929	3	CYP6WM2a	>Ctenocephalides_felis-1886+17675017-CYP6WM2a MDLINIFLLLLTFVGTFIYYHYSYSTYSSKGIASFRPLPFVGNFKDVLAKV NSGVFMKSLYERTKAPALGMYVFNKPSLLVRDPEWIKTILVKDFNFFYDRIV AVAGDGLTGTGNLFSIKNPDWKQMRVKLTPIFTSGKMKSMFHLMNDEG RNLNEYLHKLADSKQPSDNARELSARYTTDVIATCAYGIKANCMMNPEAE FRSIGRKIFEVSFRVFEASSFFFFPRIVSLLGLKFFAHEGTEFIRNTFNETI RIREESKTRHDLVDLIDLKNAKTAPGEIKFDGDTLVAQAAVFFTAGFETS SSTMSYTYELAINPDVQKLRRAEIKEIVAEDDITYESINKMSYLDMVISSETL RKYPPLAFLDRKVVDNSNGYRLPKPHDDVLEPGTPIYIPMLGLHMDPEY FPDPEKFNPERFTDEAKRNRIPTYFPFGTGPRNCIGERFGLLQTKLGLVH MLKDFTVHPCADTPSKITFTPLSFLLPKDTINLKFLRA			XP_026471996mC
Big 2 NW_020536999 - QVAO01000845	+13685595 - 13689543	3	CYP4192A1c	>Ctenocephalides_felis-0845+13685595-CYP4192A1c MIILSLVMILMLTVYVHYKYTFGQFRWRRVXHEKGLPLVGNMLDCILQKRHI IDVMHEIYQKFPDFPYFGFYRFCTPVFVIRDLQARQILVKDFNYFKDIDLH CTDDILLKKNIFMMKGEKWREYREKVAPMLSSGKIRLVFPLLYKTCDLV KHIRNAEGSSTTGLETRELSNKYTTEVIASCAFLEANCLNRFREDSIFRE MGKKIFEPTTWTINILVTAVPILSKFINIRFVPELVTDWIIMVQDQTVQYRK DNKIKRDDFLQNLMLHDQTDGQKFTMEDIAAQCSTFLLDGFETSGSVIC LALYEIAKNPDVQDRMVKEIEEVKLGHEKVTYDAMIEMTYLDAVINETLRK WPIVAAFPRCTEDYELPPFEGGPKRAIGIKRGDSVHVAIGSFHKDPQYFS NPKFDPSPRFEGSTETFTKDAFFPWGAGPRLCLGQRFALQIKTSVMAV VRSFKLKISEGKDADPKLDRSFMPLRVGGAWITYTPR		two frameshifts at X but TSA GAYP02016187.1 shows X1= P X2 =Y	XP_026474527
Big 2 NW_020536999 - QVAO01000845	-13902051 - 13899004	3	CYP4192A1a	>Ctenocephalides_felis-0845-13902051-CYP4192A1a MIILSLVMILMLTVYVHYKYTFGQFRWRRVPEHEKGLPLVGNMLDCILQKRHI IDVMHEIYQKFPDFPYFGFYRFCTPVFVIRDLQARQILVKDFNYFKDIDLH CTDDILLKKNIFMMKGEKWREYREKVAPMLSSGKIRLVFPLLYKTCDLV KHIRNAEGSSTTGLETRELSNKYTTEVIASCAFLEANCLNRFREDSIFRE MGKKIFEPTTWTINILVTAVPILSKFINIRFVPELVTDWIIMVQDQTVQYRK DNKIKRDDFLQNLMLHDQTDGQKFTMEDIAAQCSTFLLDGFETSGSVIC LALYEIAKNPDVQDRMVKEIEEVKLGHENKVTYDAMIEMTYLDAVINETLRK WPIVAAFPRCTKDYELPPFEGGPKRAIGIKRGDSVHVAIGSFHKDPQYFS NPKFDPSPRFEGSTETFTKDAFFPWGAGPRLCLGQRFALQIKTSVMAV VRSFKLKISEGKDADPKLDRSFMPLRVGGAWITYTPR			<b>XP_026461544</b>
Big 2 NW_020536999 - QVAO01000845	-13920215 - 13916221	3	CYP4192A1d	>Ctenocephalides_felis-0845-13920215-CYP4192A1d MIILSLVMILMLTVYVHYKYTFGQFRWRRVPEHEKGLPLVGNMLDCILQKRHI IDVMHEIYQKFPDFPYFGFYRFCTPVFVIRDLQARQILVKDFNYFKDIDLH CTDDILLKKNIFMMKGEKWREYREKVAPMLSSGKIRLVFPLLYKTCDLV KHIRNAEGSSTTGLETRELSNKYTTEVIASCAFLEANCLNRFREDSIFRE MGKKIFEPTTWTINILVTAVPILSKFINIRFVPELVTDWIIMVQDQTVQYRK DNKIKRDDFLQNLMLHDQTDGQKFTMEDIAAQCSTFLLDGFETSGSVIC LALYEIAKNPDVQDRMVKEIEEVKLGHEKVTYDAMIEMTYLDAVINETLRK WPIVAAFPRCTKDYELPPFEGGPKRAIGIKRGDSVHVAIGSFHKDPQYFS NPKFDPSPRFEGSAETFTKDAFFPWGAGPRLCLGQRFALQIKTSVMAV VRSFKLKISEGKDADPKLDRSFMPLRVGGAWITYTPR			XP_026474633

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 2 NW_020536999 - QVAO01000845	+15137293 - 15210823	2	CYP306A1	>Ctenocephalides_felis-0845+15137293-CYP306A1 MTSSFRKAWNLLPVDLLHKHRTGTGTLFYVVSAAQYFWLVKQPHLILFF LVVIISFILYVKFAPDKPEGTIDPPGPKGYPIGNLLELDPKTPHLSLAAMAKK YGFIFSLKLGSVYTVVFSSEKLIRQILGQQVITGRAPLYVTHGIMEGKGIICS QGELWYEHRRFLLSWLKATGRMFFGPEKNLETHIQKCMACHVKAMKEA SEGDGINVSSAIHYALGDIMNQLVFGVSWPEDHPTWKYLVHLQEEGIKH MGVCGPVNFIPIRFLPSNFKTLRFLLDGKRKTHQIYDTIINNHLKMDVRS RQPCDLKTADFKVIHDPAFEKIVEKLNKELLNASDNEYSADCVLDDYLY EEVRRQDEEFSDQLRHALADMWAGVDTTAAATLRWLLVFLAVHQDCQ EKARKDLPKDRPICAKDRQTATYLQACILETQRMRSVPLGIPHGAMEDTL ISDYYPKGTMVIPFQWALHMDPLWPEPEKFKPERYLDENNQIKLPGNLL PFQAGKRVCLGEELARTLLFIGAGTILQQVNVSMPEYNSKSDVESILDGIC GLTMVPGDHKLHITKVVTRDQ		two frameshifts corrected by TSA GAYP02009951.1 and GAYP02003435.1	XP_026475192
Big 2 NW_020536999 - QVAO01000845	-15222582 - 15216109	2	CYP18A1	>Ctenocephalides_felis-0845-15222582-CYP18A1 MYTKSAILQYAWRGLQQTWTPDARSLTFTVFCALLLVMLQYLVRAYKEV RMLPPGPWGLPVMGYLAFIGHEKHTRYLELAKRYGSLFSARLGNQLTVV MSDYKMIRDAFRREEFTGRPDTPFMQTLDFGIINSEGLKWKDQRRFLHD KLRQFGMTYMGNGKLMERRIMTEVHELLSTLNATNGRPTDLSPLAVSV SNVICNIMMSVRFSDIDPRFRFTWLIIEGMRLFGEINTVDYIPTYQYLPK AYARNKIKNREEMFNFYQEVIDEHRRTFDPSNIRDLDVDTYIAEQKAKEEG RDGELFEGKDHQDQMIQIGDLFSAGMETIKTLLWINVFMRLHPDAMKVV QEELDQVVGDRDLPRIEDLPFLPTTESTILEAMRRSSIVPLATTHSPTRDV HLNGYLIPAGSQVPLINSVHMDPTLWVKPEEFNPGRFIDAEGKVHKPEY FMPFGVGRMCLGDVLAARMELFLFFASLMHTFNVSLEPAGATVPSLKGNV GITISPDQFQVVLTPRPLNAPLVSSQEVFRNIGAH			XP_026467357
Big 2 NW_020536999 - QVAO01000845	-15252748 - 15252590	2		exon 1	CYP18A1		
Big 2 NW_020536999 - QVAO01000845	-15997430 - 15994424	2	CYP303A1	>Ctenocephalides_felis-0845-15997430-CYP303A1 MLVAILIFICITLLLYLETKPKNYPPGPSWLPVVGSAVALFKERKLNKFLYK ATVKLAEKYSPKHRVGLRIGKDRIVVVCYESIEMELLNEDIDGRPTGPF YETRTWGERRGILTDEEFWQEQRRFVVRHLKEFGFRKAMVDLIQDEA EHLLEDIKSKVGTGEKLLPMHDAFYCVLNTLWSMMAGVRYSIHDKELLQ LQDLLAELFANIDMVGCLFSQFPVLRFLAPELSGYKRFIRIHKLWFLKEE LDKHKQNLKANDEPRDFMDVYLKMIASQEKNSSEKQLLAICMDMFMA GSETTSKGLGFMFLYLRNPDKQRKAQAEIDAVIGRNRLPTLEDQSMFY CEALVMEAIRLFMGRFTGIPHRALRDTKLCGYTIPKDAMVIANFHGILMNP RHWDDPEVFRPERFLDPVTGNLISPNEYQYIPFGLGKHRCVGMELMARSN TFLFTITLLQTYTFDVPPEEMPTEDAVIDGATPGVQPFNALVKYRDCA			XP_026475298
Big 2 NW_020536999 - QVAO01000845	+18916208 - 18918847	3	CYP9FH5b	>Ctenocephalides_felis-0845+18916208-CYP9FH5b MDYLTWILVAVLIYFYIYSTWNYGRFDGTVKPYQKPPFFGNSGKFLFGM ETIVTSFSKLYDIFPNKRFYGVFQMRTPAIVIRDPPELIRQVGVKDFDHFMMN RQFVKEDLDPMFSNIMFNLDQDQKWRNMRATLSPAFTGSKMRNMFVLI CTQQMGFEFMKKKINEKGPQSLELKEFYTRAATDIIASTAFGLKVDLQDEQ NIFYRMRGQKLTGENFKAIKIFAYLLIPRVMKFFNISFIDYECGNFFRKLVD MALREKENIHRPDMIQLLMQAKKGLVSTNEDKDDTDNAGFATAAESTTKI ETIKTVWTHDELTAQALMFFLAGFDTTSTVLCFLTHELATHPEIQERLQREI DDVCSNISGTPNYETVVRMXYLDMVSEGLRLWPPFVATERVCTKSYNLE DHEGNKFEIKPGEVIGYPIYALQRDEKHFENPNHFDPERFSEENKHKIQPF TYMPFGVGRNCIASRFALMSVKMIIFELLRNFDIVPCEKTIPLKLTGTF NMKVEKGFVVTFKQRCK		frameshift at X. no TSA support but X = K in the other CYP9FH5	XP_026475344mN
Big 2 NW_020536999 - QVAO01000845	+18921639 - 18923921	3	CYP9FH6a	>Ctenocephalides_felis-0845+18921639-CYP9FH6a MEFITWILVAVLVYAFYKYSTWYDRFEGTKVYKPPFFGNTGPFMLRM ENMIDNVGKVVYRSFPNKRFGVQFQMRPAVMIKDPPELIRQIGVDFDHF NHRPFITDDVDPMFGNVMLNLDQDQKWRDMRATLSPAFTGSKMRNMFRL LSECTEQMADFMKKEIDTKGQPSLELKNLYTRATTDVIASTAFGLKVNLSK EKDNLFYRMRGQRFNFGGALTVMKLFAMHMFVKVMKFFKIALADDESSNF RSLVGDITIALREKENIHRPDMIQLLMQAKKGLRHEVTKNEDHNDNDNDA GFATVAESHVTKSHTTKRVTWDDDELTAQAMIFFLAGFDTTSTVLCFLTHEL ALHPEIQRLQEQEIDDICDPSYETVVMKXYLDMVSESLRLWPPPLA VTDRCVCIKPYEIEDYEGNKFEVRKGEVLYPIYLRDEKYYENPKDFDPE RFSDDNKHKIKPFTYMPFGVGRNCIASRFALMEVKMIIFELLRHFDIVPCE KTIPLKIKKSTFNMHVEKGFVVTFKQRCK			XP_026475344mC
Big 2 NW_020536999 - QVAO01000845	+18925591 - 18925761	3		partial exon 1	CYP9FH7a		
Big 2 NW_020536999 - QVAO01000845	+18940426 - 18943027	3	CYP9FH5a	>Ctenocephalides_felis-0845+18940426-CYP9FH5a MDYLTWILVAVLIYFYIYSTWNYGRFDGTVKPYQKPPFFGNSGKFLFGM ETIVTSFSKLYDVFPNRFYGVFQMRTPAIVIRDPPELIRQVGVKDFDHFMMN HRQFVKEDLDPMFSNIMFNLDQDQKWRNMRATLSPAFTGSKMRNMFVLI ECTQQMGFEFMKKKINEKGPQSLELKEFYTRAATDIIASTAFGLKVDLQDE QNIIFYRMRGQKLTGENFKAIKIFAYLLIPRVMKFFKISFIDYECGNFFRKLVD NTMDLREKENIHRPDMIQLLMQAKKGLVSTNEDDNDTSDNAGFATATESA TKIETIKTVWTHDELTAQALMFFLAGFDTTSTVLCFLTHELATHPEIQERLQ REIDDVCSNISGTPNYETVVRMXYLDMVSEGLRLWPPFVATERVCTKSY NLEDHEGNKFEIKPGEVIGYPIYALQRDEKHFENPNHFDPERFSEENKHKI QPFTYMPFGVGRNCIASRFALMSVKMIIFELLRNFDIVPCEKTIPLKLTG GTFNMKVEKGFVVTFKQRCK			XP_026475345mN
Big 2 NW_020536999 - QVAO01000845	+18945416 - 18947689	3	CYP9FH6b	>Ctenocephalides_felis-0845+18945416-CYP9FH6b MEFITWILVAVLVYAFYKYSTWYDRFEGTKVYKPPFFGNTGPFMLRM MENMIDNVGKVVYRSFPNKRFGVQFQMRPAVMIKDPPELIRQIGVDFDHF PNHRPFITDDVDPMFGNVMLNLDQDQKWRDMRATLSPAFTGSKMRNMFRL LSECTEQMADFMKKEIEAKGQPSLELKDIFYTRATTDVIASTAFGLKVNLS KEKDNVIFYRMRGLRNFNFGGALTVMKLFAMHMFVKVMKFFKIALADDESSNF FRSLVGDITIALREKENIHRPDMIQLLMQAKKGLRHEVTKNEDQNDNDIDA GFATVAESHVTKSHTTKRVTWDDDELTAQAMIFFLAGFDTTSTVLCFLTHEL ALHPEIQRLQEQEIDDICDPSYETVVMKXYLDMVSESLRLWPPPLA VCIKPYEIEDYEGNKFEVRKGEVLYPIYLRDEKYYENPKDFDPERFND DNKHKIKPFTYMPFGVGRNCIASRFALMEVKMIIFELLRNFDIVPCEKTI PLKIKKSTFNMHVEKGFVVTFKQRCK			XP_026475345mM
Big 2 NW_020536999 - QVAO01000845	+18949327 - 18951810	3	CYP9FH7b	>Ctenocephalides_felis-0845+18949327-CYP9FH7b MDFITWILVAVLVYAFYKYSTWYDRFEGTKVYKPPFFGNSGKFLFRLE NMIENAKEYNKPNDRFYGVFQMRPAVMIKDPPELIRQIGVDFDHFMMN HRAFISEEVDPIFGNLFMTQDQK*RDMRATLSPAFTGSKMRNMFVLI TQQMAEFMKEIQKGPQSLELKDIFYTRATTDVIASTAFGLKVDLQDE NLFYKMGNEFQFGFMVLTFAYLMAKIMQFFKIGLTSESSANFFRSLV RDTMALRDKENIHRPDMIQLLMQAKKGLRHEVTKNEDQNDNDIDA AESHATKTHTTKRVTWSDDELTAQAMIFFLAGFETTSTVLCFLSHELAVHPEI QRRLQEQEIDVCSNIDKPNYETVVMKXYLDMVSESLRLWPPPLA CAKPYELEDYDGNKFEVRKGEVLYPIYLRDEKYYENPNKDFDPERFND DNKHKIKPFTYMPFGVGRNCIASRFALMEVKMIIFELLRNFDIVPCEKTI PIKIKKSTFNMHVEKGFVVTFKQRCK		stop codon at * but TSA shows * = W	XP_026475345mC

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 2 NW_020536999 - QVAO01000845	+18968513 - 18968833	3		part of exon 8 (at end of NNNN gap) and exon 9 (with frameshift)	CYP9FH6a		XP_026475346
Big 2 NW_020536999 - QVAO01000845	+18970448 - 18972895	3	CYP9FH7a	>Ctenocephalides_felis-0845+18970448-CYP9FH7a MDFITWILITVLAYAFYLYATWYNYRFRKDSNVPHQKPLPFFGNLASFLFRLD NMIENGEKIYKFPNNRFYGVQFRMPGVVLDKPELIRQTGVKDFDNFMN HRAFISEEVDPIFGNIFLTMQDQKWRDMRATLSPAFTGSKMRNMFVLISEC TQQMAEFMKNEIQKGPQSLELKDFYARATTDVIASTAFGLKVDTLKDKKE NLFYKMGNEFQGGFMMVLKTFAPLMAKIMKFFKIGLTSESSANFFRSLV RDTMALRDKENIHRPDMIQLLMQAKXGALHHDISKTEENIDNTADAGFATV AESHATKTHHTKRVWVSHDELTAQAMIFFLAGFETTSTVLCFLTHELALHPEI QKRLQQEIDEVCISINDKPNYETVVGMYKLDMMVSESLRLWPLAVTDRV CLKSYLEDYNGKFEVKGESIMYPIYFLQRDQKYENPNKFDPERFND DNKHKIKPFTYMPFGVGRNCIASRFALMEVKMIIFELLRHFDIVPCEKTI PIKIKKSTFNMHVKEGFWVTFK		frameshift at X but TSA shows X=K	
Big 2 NW_020536999 - QVAO01000845	+18975369 - 18977288	3		partial gene., exons 6 and part of 7 missing	CYP9FH7a		
Big 2 NW_020536999 - QVAO01000845	-24320874 - 24317820	2		partial gene, exon 1 missing, frameshift in exon 3	CYP18A1		
Big 2 NW_020536999 - QVAO01000845	+45691637 - 45693452	3	CYP6WP2	>Ctenocephalides_felis-0845+45691637-CYP6WP2 MSGCNCVSWWLAATALVGFYVWKLKQAFWFESRNIPCEKPTFIVGNF GDVFRGKISIGNAVKKIYNEFKTKGYPAGFYMMFTPLRVLVDPEAIKNILVKD FQYFQNHGMFYNEKDDPLSAHLFAIEGKWKRLRVKLSPTFTSGKMKMM YGTMIESADELKEYMQETVAKNPDLVLDILARFTTDIIGSCALGIQCNTLK NPDAEFREIGKRMFRGSLWLTIKRVFSAANQNLARKLGVAFIDPIVSKFFFK TISETMKYREENNIKRNDFLQLLMQLKSKGCLDDHEEGEIVDDKALTNE VAAQAFVFFVGGFETSSTTMSFCLYELAINPEIQKCKREEINKVLDKHDGK LTYECILQMEYLDRIYETMRKYPIPLVNLRECNKDYTLPGTTTTWIPKGTGV FIPVSLHHDPEIYDPDEKFDPRFTTEAKSSRHFTYLPFGEGRICIGM RFGMMQTRLGLTIIRNYKIERSEQTPIPLVINPQSFLTASVGGIHLKFEPL			<b>XP_026469026</b>
Big 2 NW_020536999 - QVAO01000845	+45701940 - 45704405	3	CYP6WP1	>Ctenocephalides_felis-0845+45701940-CYP6WP1 MSECNCLRWLAILALVIGFIYWRKEAFKFWQSRNIPHQSPSPFFGNFG KVFFGKASIGMAVEEYINFKGKGPYAGYFTLLSPTLVLDPEAIKNIMVKD FQYFHNREGEYNEKDDPLSAHLFSIEDEKWKRLRKKLSPTFTSGKMKMM YSTMMENVNELKEYMQETVAEKSTFEIKDVLARFTTDVIGSCALGIQCNTL KNPDAEFREIGRKFVQNNIFIVKQLFAFTYKLSRRLGITVIDKEVTKFFLD RIDETIQFREKNNVKNDFLQLLQIKKGYLEDNEGEVIEDKSALTNEIAA QAFVYLGGFETSSTTMSFCLYELAVNPDIQKCRDEINRILDENDGKLSY DCILQMNLYDKVIYETMRKYPTPLVLTRECKDYTLPGTTFWIPKGTSVFIP VIGLHKDPEIYPNPEKFDPERFSEEAKNSRHQYTYLPFGEGRICIGMRFG MMQTRLGLTIIRDYINILPNETKIPLLELDRSFLTAAGGITLKFESL			XP_026469046
Big 2 NW_020536999 - QVAO01000845	+47356986 - 47369878	mito		truncated at N-term: exon 1 and part of exon 2 missing in NNNN gap. 2 frameshifts in exon 10	CYP49A1		
Big 2 NW_020536999 - QVAO01000845	-47576468 - 47557380	mito	CYP49A1	>Ctenocephalides_felis-0845-47576468-CYP49A1 MSVNAASRTSSKVLRVSKSFSSAITIPDELGTGIIHGQDKKVEETTRTYPKA YEEIPGPKELPLIGNAWRFAPFIGYQYKIHLDKVMMSLHKDFGNVVRVGG VGHDPDLDFVFDGEEIRRVFRRETLPHRPSMPSLHHYKAVLRKDFGKDA GIIGVHGEKWDAFRAQVQQLMLQPATAKRFVGPLDEIAGDFMQRIHEMRD GNQELPGNFLGELYKWALESIGRVALDTRLGCLSRDLEPNSEFQRIISAIN FFWNVAEVELRVPLWRIYPTKSYRKYIGALDEFRELCMKYISIAMENMDKS NASGNYSIVQKILNETSNPKLAVALDLDLLVGDVDTTSMVMTTIIYQLSQNQ EKQRLRDELKSLPTPGTPIVQALEKMQYLKACIKALRMKPVILGNR SLQSEAVVGGYKVPKGTHTVIFPHYVVSNEERYFKEPEQFRPERWLKARN ACPHADQEARTEDQIHPVSLPFGYGRRTCLGRRFAEAEQLLAKIFRKY DVQYNYGQLTYKVSPTYIPVEPLKFKLELS			<b>XP_026462420</b>
Big 2 NW_020536999 - QVAO01000845	-48256716 - 48255127	3	CYP6WR1a	>Ctenocephalides_felis-0845-48256716-CYP6WR1a MSEEFFTNLYLILVPLVLLIYLYCFELKFNHWKNGVKYAKSIPFFGSVASVT LLRENVSEKLLKIYNDPFRERFVGFYQSNTPVLLIRDLELAKQILVKDFQHF PNRDNFRKIKYDPLSDNLFYMDVAKWELRHELAPAFSAKLTMMSTLT EFSYEFNQYVKKLVAHDSQIDVQDLCSNLTQVIGSCIFGINVDAINNSKSK FREMIDKVFQRSFYHLIQRISIGTMSPWLFALHMRSMDEVEQFFVSVVK DIVNYRKQNDIQRGDFLQILIDLREKIPDLTSGSKLSFIMDDNLLAQMFI FAAGFETTSSAMSFCLYELALNVHIQNLQKEIDRTLCEENDGKLSYDAIME MEYLDQVLAETLRKYPPSGSLIRKCESKYTLPETDILEKDDLVVISVYALH HDPKYYPEPEKFDPRFTKENKESRKQFSYIPFGEGRMCIQGRFAKLQA KIGLISILKDFEVILCKETKPIAFQAANPILRAKNGIQLSLQSR			<b>XP_026478195</b>
Big 2 NW_020536999 - QVAO01000845	-48263292 - 48257183	3	CYP6WQ1b	>Ctenocephalides_felis-0845-48263292-CYP6WQ1b MLEYILILPLGIVAFYLYTQKHQYWAQKGVKHEKVPVIFGNVNDIMLMRS TTGQGMQRLYNLFPDEFFIGVYQSKKPVLLIRDPELIKQVLVKDFQHF GIVSNHKLDPLENLNFMEGQKWKDLRHKLTPFTSGKLSMFASLAECG KEFNLYKIEITAEQNFEMLDLGNFTTQVIGSCVFGININSIKDPDSEFRK MGKKAFFPSPMVVVKRFIRSTTTPALFRLLKMKVIAEVENFFLTVVNDMLD YRTKNNVVRADFLQILMDLKEQELQGINQDKQLNFKMDDNLLAQMVFV VAGFETSSTTMSFCLYELALNCIQKRVHEEIDEVLEQHDGNSYESVLQ EYLEQVISETMRKHSPAGNLIRKCEIPYIPDTKITLKKGDSIIPVHALHHD KYFSPPEQFDPERFSKEAKESRHPYCYLPFGEGRICIGLRFKQTA ISILQDFEVPCEETEIPLYNPKNLVLRRAKHGIRLRLKRRSDKNIMD			<b>XP_026478207</b>
Big 2 NW_020536999 - QVAO01000845	-48309226 - 48306848	3	CYP6WR1b	>Ctenocephalides_felis-0845-48309226-CYP6WR1b MSEEFFTNLYLILVPLVLLIYLYCFELKFNHWKNGVKYAKSIPFFGSVASV TLLRENVSEKLLKXXMLSTLTFEFSYEFNQYVKKIVAHDLQIDQLCSNLT QVIGSCIFGINVDAINNSKSKFREMIDKVFQRSFYHLIQRISIGTMSPWLF LHMRSMDEVEQFFVSVVKDLVYRQNDIQRGDFLQILIDLQKIKPDLT SGSKLSSIMDDNLLAQMFIFFAAGFETTSSAMSFCLYELALNVHIQNLQ KEIDRTLCEENDGKLSYDAIMEYLDQVLAETLRKYPPSGSLIRKCESKY LPETNVIIEKDDLVIPVYALHHDHPKYYPEPEKFDPRFTRENKESRKQFS MPFGEGRMCIQGRFAKLQAKIGLISILKDFEVILCKETKPIAFQAANPIL AQNGIQLSLQSRN		genomic NNNN gap at XXX	XP_026478228mC
Big 2 NW_020536999 - QVAO01000845	-48315844 - 48309682	3	CYP6WQ1a	>Ctenocephalides_felis-0845-48315844-CYP6WQ1a MLEYILILPLGIVAFYLYTQKHQYWAQKGVKHEKVPVIFGNVNDIMLMRS TTGQGMQRLYNLFPDEFFIGVYQSKKPVLLIRDPELIKQVLVKDFQHF GIVSNHKLDPLENLNFMEGQKWKDLRHKLTPFTSGKLSMFASLAECG KEFNLYKIEITAEQNFEMLDLGNFTTQVIGSCVFGININSIKDPDSEFRK MGKKAFFPSPMVVVKRFIRSTTTPALFRLLKMKVIAEVENFFLTVVNDMLD YRTKNNVVRADFLQILMDLKEQELQGINQDKQLNFKMDDNLLAQMVFV VAGFETSSTTMSFCLYELALNPGIQKRVHEEIDEVLEQHDGNSYESVLQ EYLEQVISETMRKHSPAGNLIRKCEIPYIPDTKITLKNKGSIIIPVHALHHD KYFSPPELFDPERFSKEAKESRHPYCYLPFGEGRICIGLRFKQTA SILQDFEVPCEETEIPLYNPKNLVLRRAKHGIRLRLKRRSDKNIMD			XP_026478228mN

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 2 NW_020536999 - QVAO01000845	-48352239 - 48347815	3	CYP6WQ1c	>Ctenocephalides_felis-0845-48352239-CYP6WQ1c MLEYLILPLGIVAFLYFYTKHFQYWAQKGVKHEKPVIFGNVVDIMLMRS TTGQGMQRLYNLFPDEPFIVYQSKKPVLLIRDPELIKQVLVKDFQHFQPNR GIVSNHKLDPSENLFNMEGQKWKDLRHKLTPFTTSGKLSMFASLAECG KEFNLSYLKEITAEQNFEMLDLSDGNFTTQVIGSCVFGININSIKDPDSEFRK MGKKAPEPSPVTVFKRXIRSTTPALFRLLKMKVIAPEVENFFLTVVKDMLD YRTKNNVKRADFLQILMDLKEQELQGINQDKQLNFKMDDNLLAAQMFVFF VAGFETSSTTMSFCLYELALNPDQKRVHEEIDEVLEQHDGNLSYESVLQL EYLEQVISETRMKHSPAGNLIRKCEIPYIPDTKITLNKGDSSIIIPVHALHHD KYFSPPELDFPERFSKEAKESRHPYCYLPFGGPRICIGLXFCFKQTAVGLI SILQDFEVPCEETEIPLTYNPKNLVLRKAGHRLRKRSDKNIMD		two frameshifts at X. X1= F X2 = R in other CYP6WQ1 seqs and TSA	
Big 2 NW_020536999 - QVAO01000845	-51983033 - 51837075	4	CYP4VF1	>Ctenocephalides_felis-0845-51983033-CYP4VF1 MDRSVLAALVALLIYPVILLIQAWMRRRKFIELVERLPGPKAKPLVGNMTD FRVPREEVFKVFAKRIKENGFLFRVWAGPIAVVIRKAELYETIMSSSKYIDK SYGKFLHPWLGGLTSSGSKWLNRRKVLTPAFHFGTLEGFFDNIQVQA RILVKLLRKHAVDGEFFNVYPYITRAALDIICETAMGVSVAQEDENNSYV RAISEVATLLTRFLSPWLFDFSKISSQGGQFFKQLQVLHGFTHKVIAER KESRKNAGTQVETEDIPGVKRRPFLDLLDQEQGGGLTDQDLREEVD FMFEGHDTTSGICWTLHVLGLHPDVQKQVHEELDEVLPVTDLITRE SQLRYLEMVIKESMRLYPPVPGISREITEDVKVGEHLIPAGCMIQMSLFYH RDPDHFDPDKFDRFTPEASRGRHPYAYAPFSAGPRNCIGQKFALMEE KAVLATVLEVVVTLKQETLCAELILRPPDGMRIKLQQRHTER			XP_026462136
Big 2 NW_020536999 - QVAO01000845	-52038194 - 52022913	4		exons 1 to 6	CYP4VF1		
Big 2 NW_020536999 - QVAO01000845	-52062298 - 52093549	4		partial gene, exons 1 to 9 , no exons 10 - 11, exons 12-13	CYP4VF1		
Big 2 NW_020536999 - QVAO01000845	-94470812 - 94468583	3		partial gene, exons 1-2 missing, frameshift in exon 3	CYP9FG1		XP_026461383
Big 2 NW_020536999 - QVAO01000845	-94487031 - 94484676	3		partial gene, exons 1-2 missing	CYP9FG1		XP_026461385
Big 2 NW_020536999 - QVAO01000845	+94516451 - 94517912	3		exons 1 and 2	CYP9FG1		XP_026461386
Big 2 NW_020536999 - QVAO01000845	-94555771 - 94542568	3	CYP9FG1	>Ctenocephalides_felis-0845-94555771-CYP9FG1 MDLSINQSDYIILGGILLVYWRVTKSQRRFSKTIYVPLKVPVILGSTWRNF FLENQIYTYGRAYENFPDSRFSGFYEVLPVLLIRDPELVRQMGVDFD HFVDHNFIDETDPLLGMMIVMRGQKWRDMRSTLSPAFTGSKMRNMF QLVLSAQMALHLKKTETKNGSVTLEMKSLFTKYANDVIASCAFLEVD SLRNPENEFYKFGKVTGFGGLDALLRFLGNLAPSLMRALNINFLDKQT MRFFRSLVHDTMSTRELQKISRPMIHLMLQARKGTLRDEDNAKSDSTA KRDWSDDELTAQALIFLIAGFDTTSTLLMFLAYELALNPEVQECLQEEIDSIF NADGDEGLTYEKAKATYMDMVISLTKRWPPVFLDRICLKDYEIEDNIG RKYTVKRGEGVLPVYHHRDQKYFPDPERFDPERFNDENKNIQPFYTM PFGVGPNCIGSRFALMETKAMLFILSSFNFRCLKTEYPLKLSKRDFDLV PANGVWVDVEPRKK			<b>XP_026461388</b>
Big 2 NW_020536999 - QVAO01000845	-95728506 - 95721838	2	CYP305A30	>Ctenocephalides_felis-0845-95728506-CYP305A30 MLDSTYLLFVCLICTLVANHLRRPYNYPPGPRWLPVVGNSPQLRRLA RAVGGTHRALAIWANTYSTSVLGLRLGGDYVVVLFGAKTVREALCREEFD GRPDNFFIRLRTMGSRMGITCTEGQLWTEQRNFVVRHLRQVGYGKQAM EDQIVNELKELISVIDALGNSVNFRELAPSVINVLWTLTAGKRISRDDQRL ERLLTLLSQRSKAFDTAGGSLSQMPWLRFIPESSGYNLLLRNFNKLHSLF METITDHRNNHKASQADDLIHAYITEMESRKGKPFSTFDVQLTMVILDIFIA GSQTSNTLDFAFMLMLNRPDLQMKIHQEIDEVLGNNLPKLEDRAKMPFV EAVLLEVQRYFHIVTLNPPRRVTRDITIGGYNIQKDTTFLMSLYSLHKDVE YWGDPENFRPERFLSEEGYLPDHLIPFALGKRRCLGEALAKACMFIFF TGILQHYELYDNDQEKPSIDPIGILTSPRPYKANVRKRIIR			<b>XP_026471391</b>
Big 2 NW_020536999 - QVAO01000845	-95754364 - 95740264	2	CYP15A1	>Ctenocephalides_felis-0845-95754364-CYP15A1 MILAIIFMVAVVVWVWCDTRKPFYPPGPAWLPLIGNLLYLRWRMSVIKYH HLVWRELSDRYGSVGLRDLRDLVLSGRDAIHEVCTREEFDGRPEGFF FQMRFTGQRLGVVFTDGPLWAEHRRFVVRHLRSLGFRSGMERLLQEE SDGLIVQLRERAKEGPVFMHTAFDVPVNLVWAMMAGKRFELNDRKLLRL FDLVHDSFRMLDMSSGLLNELPILRYIAPNWSGYNQINKTKLDLYDFLKET VDEHRATFNDEVIRDFIDAFFHEMKNANGSTFTEQQLSLCLDLFQAGS ETTSNTLGFVLYVILYPNVQKEIHRELDREVVGKDRPPTLQDRSNLQYIVAV LMEVQRIGNIAPVSVGHRAKMTSELRGHIIPKDTIILISLHSLHNDPDFWQD PDVFRPERFLKPAESSLSSEYLAPFGLGKRRCLGEALARSSLFIFFARLL QCFELRAVNGEQPQTGLDGVTLAPKPFRAHLIPRI			<b>XP_026471392</b>
Big 3 NW_020537324 - QVAO01001170	+8469319 - 8476461	mito	CYP12AJ1	>Ctenocephalides_felis-1170+8469319-CYP12AJ1 MLLVIKQTSLSKNVTRKNIIRKISCAAINSAEVQPMYATTNDDSPKMPAGW ELALPYSKVPGPKSIPVLGIMHHFFPGGKYGNMNFREYTKMNQYEGDLV RLKGFDDGKEDICVSNPDHFETIFRNDGATPRRNIFDTRLYRRTKINPEIK DNIGVLIENGEKWKLRSMVNPVLMQPRVSKQYVKSVEGIVDEFITRRLR RDKNLETANFLNELNRWALESTICIALDTRLGCLRDDLAPDSEPQRMLKA VHEFFALTHALEFKHPWKTIKTPGFYRLMEVFQIINDLSLQKVEEAMER KNEPVQDDREQSILQKLIKINRNVAVVVAMDLLLAGVDTTSYTTSILYHLS KHQRAQDKLREELRGILPERHSLKDNSFDRIPLYRACLKESTRITPVGVA NLRTTQRDIVLSGYRIPKGTMICTQIASVSPSQHERPNEFIPERWLRQD KKGLETDMSSDVAGCPNAKTANPFSQLTFGFGVRSICIGRRISELEIHTLIAK LIRNHRVWVHHPDLMIESTLETTPASSLRYKIIELNN			<b>XP_026463470</b>
Big 3 NW_020537324 - QVAO01001170	-8567910 - 8560375	mito		full length pseudogene, multiple frameshifts	CYP12AJ1		
Big 3 NW_020537324 - QVAO01001170	-76448909 - 76430840	2	CYP307A2	>Ctenocephalides_felis-1170-76448909-CYP307A2 MAVHTFLAILAALVAFILYVLYTPEKDNHQKLIIDNHHHHHQLPLPEPPG PKPIPLGNLHLLGKYEVPFQGGFTDLAKKYGDVYKLLKLGATPCLVNSVEKI REVLNQNKGFFGGRPDFIRFNKLFXGDRNNSLALCDWSHLQKRRNLAR KHCSPRDGSSYYSKLDEVARLEMSEFLHQLEISVNPQGEYKLPVLMATC MNMFSHYMCSIRFGYEDDEFREIVRYFDEIFWEINQGYAIDFLPFLPFYR NHMKLETWSDIRSFILSRIDDRERDLDPPEPEKDFTDALLHSLREDSTV NRETIYMLEDFLGGHSAIGNLVMLALANAVRNPEVACKIQQEIDQVDFNT RSITLYDTEKMPYTVSAISETLRYSSSPVPHVATENTSIAGYAVEKGTIVFIN NYELNTSDIYWNKPEQDFPERFLEVPEDTKKQDLHNQDFHNQDSGLS DSDILDANKPKMRVKKNIHFLPFSIGKRTICIGQSLVRGFSVFMFATIMQH YVNSTSDVKNIKTYPACVAVPPDFTSLILEPRIRE		frameshift at X, no TSA seq ; X = G in Oropsylla silantiewi TSA	XP_026465022



Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 3 NW_020537324 - QVAO01001170	+85498780 - 85505240	mito	CYP314A1a	>Ctenocephalides_felis-1170+85498780-CYP314A1a MVLLLPFIVFILFISVYLLKSVKLIKDKNDENVPKGSKDIPGPMHLPLFGT KWYLYWYDLKSMHEAYEDMHQKFGPIILDSRAPPVVPVSLTGTHPRDLL RVLRYPSRFPTRPTEIVAKYRRSRPDRYASSGIVNEQGPSWHKLRSLT PELTSPRTISGFLPTLNDICRDFVSLRLVRNPDTGVVEGFETYADRLGLEA SCALMLGRRMGFLETKLSLQAEALLSKSVRDAFVAQRDSYFGARGGKVG LRKCLFGTGEANQRDAYQRLQRSEIINIVSQMVDEALELRSPKNDYK PRATNAVFESILANQDLDRDKKSAIDFISAGIETLANTLTFVLYNLSRHKTC QIKVLEEINNIKNDTDFSSEELSSKDLSSMSYTKACITETRYLPTAFCLARV LETDMNICGYLPTGTVVLCCQMLACRDEKNFINAKKVFPERWLDLYNKTI ESLARSLVVPFVGRRMCPGKRFVDQELLTVVATLVSSFEIEFEEDLDMKF EFLGQPAPVNTLRDRQE			XP_026465225
Big 3 NW_020537324 - QVAO01001170	+85557698 - 85564651	mito	CYP314A1b	>Ctenocephalides_felis-1170+85557698-CYP314A1b MVLLLPFIVFILFISVYLLKSVKLIKDKNDENVPKGSKDIPGPMHLPLFGT KWYLYWYDLKSMHEAYEDMHQKFGPIILDSRAPPVVPVSLTGTHPRDLL RVLRYPSRFPTRPTEIVAKYRRSRPDRYASSGIVNEQGPSWHKLRSLT PELTSPRTISGFLPTLNDICRDFVSLRLVRNPDTGVVEGFETYADRLGLEA SCALMLGRRMGFLETKLSLQAEALLSKSVRDAFVAQRDSYFGARGGKVG LRKCLFGTGEANQRDAYQRLQRSEIINIVSQMVDEALDRKPNDSYK PRATNAVFESILANQDLDRDKKSAIDFISAGIETLANTLTFVLYNLSRHKTC QIKVLEEINNIKNDTDFSSEELSSKDLSSMSYTKACITETRYLPTAFCLARV LETDMNICGYLPTGTVVLCCQMLACRDEKNFINAKKVFPERWLDLYNKTI ESLARSLVVPFVGRRMCPGKRFVDQELLTVVATLVSSFEIEFEEDLDMKF EFLGQPAPVNTLRDRQE			XP_026465228
Big 3 NW_020537324 - QVAO01001170	-12913309 - 12909857	mito	CYP12AH2a	>Ctenocephalides_felis-1170-12913309-CYP12AH2a MFCTKSSRLCNVASYLNLEIYISPTRNFSETVTTSPILKKTQISWHEAKPY CEIPGPKSALKSIRNPLPGGKYKISLKDHLHILLNEEYGDVRLKGRPD FILSNPDEFEQIYRNEGPWPNRREFEFKHFRRKLRPDYGDNAGLLVEH GEKWKELRGKVNPMQPRVVKPVKLVVEVAEEFIERMLHLRDSNNELP NDFSSELNKALESARIALDSRLGCLADDSEMNYDSKIMIQAVHDFHLLT FKLEVLPWRYIKTPAYTKLMAALDVMNTNLSKIDEAITRINSNKNSESES EISVLEKLLKIDKNVAIIMAMDMLLAGIDTTSNTTALLYFLAANQRCQDKLR EEIFTILPDKSSKLNESFNHVPYLRACMKEANRILPIAGGTIRKLAENVVLS GYQIPKGNVMSHLTSLRENQFPNPKIYLPERWLTGEEAQQGCPKSAKSA HPFVHMPFGFGRSCVGRFADLEVEITLVKLLRNYKVEVSYGDLNVETK LLTIPVSPKFKITEL			XP_026464268
Big 3 NW_020537324 - QVAO01001170	-12917197 - 12914969	mito	CYP12AH3	>Ctenocephalides_felis-1170-12917197-CYP12AH3 MFTLNSSHTKAVSCVSLVTRLSNTNISRAARQLATLTVQKENVQESRI SWSEAKPFEIPGPEALKSLRNFLPGGKFKHVALKEMHVMNNEEYGDIV RFKGLGKSDMIICYDPKDFEHVYRNEGPWPHRRREFEFRRFRKDLRPD VYGDNAGLLVEHGEKWELRGVNPVMMQPRVVKPVKLVVEVAEEFIE RIIQLRDSKNEMPNFLNELNKSWSLESARISLDSRLGCLVDDSKLNSDSK KMIQAVHDFFECSFKLEVLPSLWYIIRTPNYTKLMTALDVTMTNLSKIDKA VERINSNPDSKPESEMSVLEKLLKIDKNVAVIMAMDMLLAGVDTTSNTTAIL LYLLAKNQASQEKLEEILTILPNKDSKLTTEFNFKIPYLRACMKEANRILPI AGGTMRKIPVDLVLSGYQVPKGTIVMSHITTTARESQYPNPDQYLPERW LTGEASQGCPSAKNAHRFVYMPFGFGRSCVGRFADLEVEITLAKLLRN HKVEWNYGELKLVETKPLTVPISPLKFKITEL			XP_026464269mC
Big 3 NW_020537324 - QVAO01001170	-12920952 - 12918616	mito	CYP12AH5a	>Ctenocephalides_felis-1170-12920952-CYP12AH5a MFRICKISLCESTNNMLFNSSNIVNTSRRLHLSKARNLTIIEAVKNDNASEK PLLWHQAKPYSEIPGKTTLENIRSFPLGGKLYNVSCLKDLHQTMMKEYGDL AKLKGFLGKPDFVAFNPKDIEQVYRNEGLWPNRREFQVFAFRNRIRPDI YGDNAGLLVEHEEKWKELRGKVNPMQPRVVKQYIKSVEDVSDDFISK MAQMRDSNQELPSNFIIYLNKWALESISIALDTRLGCLSDAKNSDSEK MIRSVHDFEEMTFKLEFFPSLWYVSTPGFVKLMNALDITINISLKKVDEAV ERIKNNPNAKPESEASVLEKLLKIDKKAIVVMAMDMLLAGVDTTSNTTAILYFL LYFLATNQKQDKLREEIRTILPNKDSHVNNESFHHPYLRACMKESSRIL PIIGGTVRKVPVDIVLSGYQIPKGTIVVSHLTTSMKSSQFPEPEKFMPEP WLSSESEGCPLAKNAHPFHMFPFGFGRSCVGRFADLEMETFIMKLL RNYKIEWNYGELKVTTLVAHPETPLKFKLTEI			XP_026464269mN
Big 3 NW_020537324 - QVAO01001170	-12923749 - 12921634	mito	CYP12AH6a	>Ctenocephalides_felis-XP_026464271-CYP12AH6a MFTQRGSLVCKNWCKHSQSITVKNISSSQYLATVATPKETVSDIPPQWN EAKPYSEIPGSKSAFEAMRNFLPGGKYHNKSLRNVHRLMNRREYGDVNVW KGLGKPDFILAFNPKDIEQVYRNEGPMPNRREFQIFSYRKKLRPEIYGE YGGFVHEHDEKWKDLRGKVNPMQPRVVKQYIKSVENVSDEFITRMVR LRDSNQEMPADFMDLNKWSLESIGSIALDARLGCLSDNVGVNSDSGRMI QAVHDFYLLTFKLEILPSLWYIPTPSFRKLTAAALDVMTEISSKVDIAVERI KNNPNPKSDSEASVLEKLLKIDKKAIVVMAMDMLLAGVDTTSNTTAILYFL AANQKQEKLRSEILTILPDKSKLSSDSFKRIPYLRACMKEANRIIPILGGT IRKLPVNVVLSGYQVPKGTIVVSHQATSMNENQFPDSKQYKPERWLNAE EAEGCPLAKNANPFAMFPFGFGRSCVGRFADLEIETFMVKLFRNYKLE WNYDELKVASRLTQPVSPKFKLTEI			XP_026464271
Big 3 NW_020537324 - QVAO01001170	-12926167 - 12924369	mito	CYP12AH4aP	>Ctenocephalides_felis-1170-12926167-CYP12AH4aP ENGSQKPLHWNEAKSYSEIPGPKSFWEGVRNLPGGKFKYKSLKDMHVIL KQEYGDITILKAFGLQPDIVMLFNPKDFEQVYRNEGQWPHRRDFETFVHF RKKLRDIYGENAGLLAEQGERWKDLRTKVNPMQPRVVKQYIAPVEEV TDEFIARMNHLRDSNNEMPKDFSHLNKWSLESARIALDTRLGCLQDSDS RVDEDSKMIQAVHDFDLIFQLEILPSIWKYVKTTPAYHRLMRALDVTMTNV SLKKVDAAIERMINTSQDSKSEHSEASVLEKLLKIDRNVAVIMAMDMLLAGVD TTSYTTALLYHLAVNQECQEKLRKEIFTIIPQKDSKLNQESFNHPIYLRACM KESHVRLPIAGGTVRRLPVDLVLCGYQVPKGTIVVSHLTTSMKSSQFPEPEKFMPEP STKYIPERWLNKNAQPCPSAKEAHPFAYMPFGFGRSCVGRFADLEIETFMVKLFRNYKLE TFIVKLXRYKIEWNYGEMKTSQILTIPTVSPKFKLTEI		<b>Pseudogene:</b> frameshift at X, misses 1st exon, one indel	XP_026464272
Big 3 NW_020537324 - QVAO01001170	-12932059 - 12929789	mito	CYP12AH1a	>Ctenocephalides_felis-1170-12932059-CYP12AH1a MFRNINIKVYKLNNDLSNKVYETTLPRNLSITTKYAEAISQEARPKSW DEAKPFEIPGNPLLLTLFSLIPGRASKMSLKDANAQNKTYGDIVAIKGT MGRSDMIITYNPNDFEQVYRNEGPWYRRDFDTFRYFRTHVVRPDVYGD YGLVATQGWKELRGKVNPMQPRVVKQYIAPVEEVVAFIARMMLLLR DSNNELPSNFHSHLNKWSLESARIALDSRLGCLKDDSEMDPDKQMIAA VQDFAYTWKLEINMPVVKIFKTPSFNKLMAWNTMINVSVFKKIEAKQRI QTNPKPTTEHSEASVLEKLLKIDPKLAAVMAMDMLLAGIDTTSNSVAILLYFL ATNQSQDKLRQEILTILPEKNSKLSFDSFNHPIYLRACMKEATRILPIAEGN LRKLPVDLVLSGYQVPKGTIVVSHLTTSMKSSQFPEPEKFMPEP KSGCPLAKNAHPFAYMPFGFGRMCGRRFADLEVEITLKLNRCKVE WNYGELETSSRLITHPESPLKFKVTEI			XP_026465601

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 3 NW_020537324 - QVAO01001170	-12935406 - 12933049	mito	CYP12AH7a	>Ctenocephalides_felis-1170-12935406-CYP12AH7a MHRLLQINAKICGLSVTNSVFPQAGRNFSTNSKLLAVAVEVNQKAADVSW EEAKPFSKIPRVEGLKLMVNLPGGKFKYKKNILEMNYVFIKEYGNILAKGT FGKPDLLIYSPQDFEKVYRNEGIWYRRDFEIFNHRKNIRADVYGENAG LLEHGEKWKELRGKVNPMQPRVAKQYITPVEEVSDEFIQKLLKLRDS NNELPDNVCNEFNKWALESIALDTRLGCLRDDVTADSDPQKMINAVD AFFELTYKLEIMPSIWKYVTKPKYYKLVDALETMTNISLKRVDAMERLKKK ENQKSDREASVLEKLLKIDRKAIVVMAMDMLLAGVDTTSHTTAILLYFIATN PRVQDKLRQEILTILPEKNSKLSDFSFNHVPYLRACMKEANRLLPIAAGTIR KMPVDIVLSGYQVPGKTEVAMNHFIQSQDEKQYKPKKEYFPERWLSNQ TEECPFKNTAHFVHMPFGFGPRSCVGRFADLEIETIFISKLLRNYKIEW NYGELKVTSKLLTPTSPKFKITEL			XP_026464273mC
Big 3 NW_020537324 - QVAO01001170	-12942567 - 12937768	mito	CYP12AK1	>Ctenocephalides_felis-1170-12942567-CYP12AK1 MQINIALTDKESCSILTDEESKEWASALPYSEIPGPKPIVGNLHRFLPGG EFYNLQLADLYKLRRETYGEIVRLTGIANRNDLVLLFNPEHIKTVYRNEGIYP VRRGLESFVHYRKEYRPELFSKGLLTVQGYDWHLVRTKVNPMAMQPKT VRKYVEPVDQISQEFINRMMKLRDANNEMPSDFWMEVNWKALESIGRIAL DTRLGSDNPTSESLKLIKHVHMMFELIYQDLILPSVWQIVRTPNYYKLM CFDVLDRITSRHVSNVAVKRLDESPPKHSEDELSVVERLITDRITIGQVMAM DMLMAGIDTSSAVCTLLYLAQNQDKQNLRAELREAIPEPKGOITNDILR HLPYLRACIKESLRMVPVAPGNLRVNPMDVMXAGYRIPSDTEILLGHMTLA RCESQFPKADEYLPERWLKQKRGSLADRQIDNADISSTNAHPFAYMPPFGF GPRTCIGRRFAELEIEVFTSKLIRDYKVEWNHGMKFDKMINFPVNLRY KITEVN		frameshift at X, but TSA shows X= L i	XP_026464273mN
Big 3 NW_020537324 - QVAO01001170	-12953870 - 12951625	mito		full length pseudogene, at least 2 frameshifts	CYP12AH3		
Big 3 NW_020537324 - QVAO01001170	-12957616 - 12955286	mito	CYP12AH5b	>Ctenocephalides_felis-1170-12957616-CYP12AH5b MFRVKCISLCESTNNMLFNFSNINLNTSKKHLKSCARNLTTIAEVKNDNVSE KPLLWHQAKPYSEIPGKTTLENIRSFPLGGKLYNVSLKDLHQTMNKEYG DLAKLKGFLGKPDFVFAFNPKDIEKYRNEGLWPNRRREFQVFAYFRNRIR PDIYGDNAGLLEHEEKWKELRGKVNPMQPRVVKQYIKSVEDVSDDFI SKMAQMRDQKELPSNFIIYLNKWALESISSIALDTRLGCLSDADKNSDS EKMIRSVHDFLEMTFKLEFFPSFWKYVSTPGFVKLMNALDITNISLKKVD EAVERIKNNPNNAKPESEASVLEKLLKIDKKAIVVMAMDMLLAGVDTTSSNT AFLLYFLATNQKQCNKLRREEIRTLPNKDSHVNNESFHHLPLRACMKESS RILPIGGTVRKPVDIVLSGYQIPMGTEVVLSHLTTSMKSSQFPEPEKFM ERWLSQSESEGCLAKNAHPFHMPPFGFGPRSCVGRFADLEMETFIMK LLRNYKIEWNYGELKVTTKLVAHPETPLKFKLTEI			<b>XP_026464274</b>
Big 3 NW_020537324 - QVAO01001170	-12960519 - 12958375	mito	CYP12AH6b	>Ctenocephalides_felis-1170-12960519-CYP12AH6b MFTKRGSVLCKNWCKHSQITVKNISSQKYLVAEPAKQKQVSTIPLQWDE AKPYSKIPGTSALETMRNPLPGGKYNNKSLRELHNSMNHEYGDLVNWK GVLGKPDFILAFNPKDIEQYRNEGPMNRREFQIFSYRKKLRPEIYGEY GGLLIEHDEKWKDIRGKVNPMQPRVVKQYIKSVEDVSDFITRMRRLR DSNQEMPADFMDELNKWSLESIGSIALDAKLGLEDNVSANSDSGRMIQA VHDFYLTFKLEILPSLWKYIPTGFRKLTAAALDVMTEISAKKVEAVERIKS NPNPKSDSEAGVLEKLLKIDRKAIVVMAMDMLLAGVDTTSSNTAILLYFLA ANQKQDKLRSEILTILPNKDSKLSDFSFRIPYLRACMKEANRIIPILGGTV RKLVPDVLVSGYQVPRGTEIVVSHQTASMNENQFPDPKPKYKPERWLSNAE EAEGCLAKNANPFAHMPFGFGPRSCVGRFADLEIETFMKLFKNYKLE WNYDELKVASRLITQPVSPKFKLTEV			<b>XP_026464275</b>
Big 3 NW_020537324 - QVAO01001170	-12963189 - 12961179	mito	CYP12AH4bP	>Ctenocephalides_felis-1170-12963189-CYP12AH4bP ENGSQKPLNWNNAKPYSEIPGPKSFWEGVRNMLPGGKFKYKSLKDMHVI LKQYGDITILKAFGLQPDIVMLFNPDQDFEQVYRNEGWPHRRDFETFVH FRKLRDITDIYGENAGLLAEQGERWKDLRTKVNPMQPRNIKQYIAPVEE VTDEFIARMNHLRDSNEMPKDFSHELNKWSLESITRIALDTRLGCLQDD SRVDEDSKMIQAVHDFDLIFQLEILPSIWKYVVRTPAYHRLMRALDITN VSLKVDAAIERINTSQDSKSEHEASVLEKLLKIDRNVAIMAMDMLLAGVD TTSYTAAILLYHLAVNQEQEKLKRIEITILPQKDAKLNQESFNHPIYLRAC MKESHRLVPIAGGTVRRPLVDLVLGCGYQVPGKSEVVMSSHLLATMEENQY TDSTKYIPERWLNKNAPOCPSAKEAHPFAYMPPFGFGPRSCVGRFAEL EIEITFIVKLLRNYKIEWNYGEMKTKSQILTIPVSPKFKMTEI		<b>Pseudogene:</b> misses 1st exon as in 12AH4a	XP_026464276
Big 3 NW_020537324 - QVAO01001170	-12966304 - 12964026	mito	CYP12AH1b	>Ctenocephalides_felis-1170-12966304-CYP12AH1b MFRNTFKKIYKLIINDLSNKVHTTLPRNLSITTKYAEAISIQEAKPKSWDE AKPFSEIPGPNPLLLTLFSLIPGRASKMSLKDANAQNKTYGDVAIKGTMG RSDMIITYNPNDFEQYRNEGPWPYRRDFDTRFRYFRTHVRPDVYEDSYG LVATQGKAWKELRGKVNPMQPRVAKQYITPVEEVAEEFIARMMLLRDS NNELPSNFSHELNKWSLESIALDRLGCLKDDAQMDPDCQKMAIAVQ DFFAYTWKLEINLPPVWIKFTSSFNKLMNAWNTMINVSFKKIEEAKQRIQN NPEPTTEQEAASVLEKLLKIDPKLAAVMAMDMLSAGIDTSSNSVAIILYFLAT NQSCQDKLRQEILTILPEKNSKLSDFSFNHPIYLRACMKEATRILPIAEGNL RKLVPDVLVSGYQVPGKTEVVMRHSTTSVENQFPNPEKFMPERWLSAD KSQGCPLAKNAHAFHMPFGFGPRMVCVGRFADLEVEILITKLLRNYKVE WNYGELETSSRLITHPESPLKFKVTEI			XP_026464277
Big 3 NW_020537324 - QVAO01001170	-12969815 - 12967347	mito	CYP12AH7b	>Ctenocephalides_felis-1170-12969815-CYP12AH7b MHRLLQISAKICGSSVTNSVLPQAGRKFFSTNSKLLAVAVEVNQKTADVSW EEAKPFSQIPRVEALKLMVNLFPGGKFKYKKNILEMNYVFTKEYGNILAKGT FGKPDLLIYSPQDFEKVYRNEGIWYRRDFEIFNHRKNIRADVYGENAG LLEHGEKWKELRGKVNPMQPRVAKQYITPVEEVSDEFIQKLLKLRDS NNELPDNVCNEFNKWALESIALDTRLGCLRDDVTADSDPQKMINAVD AFFELTYKLEIMPSIWKYVTKPKYYKLVDALETMTNISYFXVDISMERLKKK ENQNFREASVLEKLLKIDRKAIVVMAMDMLLAGVDTTSHTTAILMYFIAT NPRVQEKLRREEILTILPEKNSKLSDFSFNHVPYLRACMKEANRLLPIAAGTI RKMPVDIVLSGYQVPGKTEVAMNHFIQSQDEKQYKPKKEYLPERWLSNQ PTEECPFKNTAHFVHMPFGFGPRSCVGRFADLEIETIFISKLLRNYKIE WNYGELKVTSKLLTPTSPKFKITEL		frameshift at X	XP_026464279/8
Big 3 NW_020537324 - QVAO01001170	-12976022 - 12972204	mito		partial gene, exon 1 missing	CYP12AK1		XP_026464281
Big 3 NW_020537324 - QVAO01001170	-13001485 - 12998051	mito		partial gene, first and last exon missing	CYP12AK1		XP_026464282
Big 3 NW_020537324 - QVAO01001170	+18223708 - 18230024	3	CYP4189A3	>Ctenocephalides_felis-1170+18223708-CYP4189A3 MDDLMLPFPVIRDIATILFGIALYFYTTKGFDFFRKRGIKHLPTYPLVGNIG SYLSGNANFIDCIQAYNAFPDQKMGVGFYFNVPVSLIIRDPDTIQQVLFDRD QHFSEHIFHVDVTDPLFGKTLYALKGDKWRAMRTTLCFAFTISKLRGFFP LLEKCCEDMINYIEDNSNFRLLIETEEFFSKFNYNVSATVALGTEKNTFRN DDEEFYKMAQKATNFIGVQGMKFTLMATFPRLSKFLRIKVVDEVLTKYFRS LIYDTISSREVTGTARYDMMQLLIQAKKGLQDDDLGVTAARNKELTDDDDIT SQALIFLITGVITSTSTMGFAYEIANNEEIQKLEIEVEVDRKKHKGELSYE IIDKMDYLGRVISETLRKWPPGIIARNCVQPYTITDNKNRITFNCDPGAVIYV PTIAIQNDPSYFPNPEEFDPRFSESRKSEIQPNYIPFGIGPRKICIGVEFSI ILAKLVMFHLLSKYTLHVSPKTIQPVELASGFMVQAKGGLWINLQRRD			<b>XP_026464369</b>

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 4 NW_020539725 - QVAO01003571	-39840953 - 39837557	mito	CYP334N1	>Ctenocephalides_felis-3571-39840953-CYP334N1 MAKKSSIFANQFDVANYPGDQALKQNLSEFDEVPGLVAVLKYIAQAWSYIPVV GKTLQWSRNVQPFDRFLFDYRGPVVRRLRGPFGGDLVLLNRPEHMEAVYK QEGFRFPVRSLLDCVEHYRREYRRYQSPGFICGPDWERLRAKIDNPLQ RSAALLHGKIENACEELVARVMRIRNRQEEVPEDFQQLFKWSMESLCAV LFSKRSGFLDPHGVAFNSEQARLLDAMHAATNSIKSCETGLQWRFYESH SWKSLVSNCDIIDSISKHIRLAQSSLRRAKKELEGRAADEGAQSAIDTTAA ANEKSCDIFGFASTPELPLIETLLREGMQAEDILTLLDMILIGANATTSAL SFVLYHLAKSQRSQVFLFDELRSVMPTRDSRLTPQALQDCPYLKACVME SLRLKPPVITRILPKEITLHSYNIPKGYMLMANQIACRENFEDAKKFM PERWMRCDERDHPFATIPFGYGRNCLGKGTARQLWLVTAKLIRNFKIE YHYGDIGSSTKLFCEPNRHLKFRFVDRD			XP_026479624
Big 4 NW_020539725 - QVAO01003571	-41793525 - 41790905	3	CYP6WN1a	>Ctenocephalides_felis-3571-41793525-CYP6WN1a MIFLNNVLTVIIAIIIVITVYSYFLYSFTYWKRDVPIQPSFPGNISAMFFR KQSMSQVMSNLYNSVQKPFPGIYVFLPRLVVKDPELIKMMVQDFQNFQ NRGNEFDPKTNALASNLFSLSGEAWVKLRNVLSPAFTSGKLVMMETITK CGEQLQEHLSEKAKNSEVVEFKDLAARYTTDIIASVAFGIDVNSVKNPDE FRQIGKIFQVSNYKDFIVKLLFNHCPNELLRISIIINADVYKIMNIVQQIVT LREKKGVVRNDFMQLIQLRNSGKVNEDDGMKVKIKDAKLLSIEAIAEAR LFLAAGFETSSMTMSSFFYEISQNPYIMKKVQNEIDTCVKRYGGFTYEALN DMKYLENCISETLRLYPVLPSTRECLTDYKIPGSKTVIPKGTIVLPIPLGLQ RDPKYFSNPEKFDPRFSDDRKDSITPYTYMPFGEGRACIGMRLAKLQ MKVGLAMTLYKFDILKSAKTSQKFRHDPESGVSLLGGIWLQIAHRK			XP_026479659.1mN
Big 4 NW_020539725 - QVAO01003571	-41796846 - 41794496	3	CYP6WN2a	>Ctenocephalides_felis-3571-41796846-CYP6WN2a MFDFIQYVFEVLVAVLVLAATYVYFKHSFTFWEKRNIPSIAPTFPGNVE PVFRSKKMSQNIADLYNSIKAPFFGIYVFCIPRLVVKDPELIKLVKDFQYF QNRGNEFDKSNALQSNLFSISGDSWQKLRNALSAPFTSGKLVMMETITK CGKNLQEFLEEKSNKEELEFKDLAARYTTDVISSVALGNEVNSVKNPNH EFREIGRIFNLPTRWDVMSIMFFMSPEILNKFLANISREVDYFMMNVV RQTVTFREENNITRPFMQLLIQLRNGGEITDDDDMKIKVQGEKQLSLDAI ASEVNLFFLAGFETSSITMSSFFYEMAHNDIMRKAQADIDASVAKHGGF NYEAMNDMKYLENCINETLRIYTTLPFLVRECSIDYKIPGHNAFIPKGTIVL PLMGLHRDPDFPNMFKFDPDRFSDERKGSIKPYTYPFGEGRACIGM RLGKMVQKMGMLAMVLHKFDILKCKSTSEEFQHDPTTAGVVHLGGIWLKVA KRKV			XP_026479659.1mM
Big 4 NW_020539725 - QVAO01003571	-41800080 - 41797623	3	CYP6WN3a	>Ctenocephalides_felis-3571-41800080-CYP6WN3a MALIFDTVLKIDITATLAVIFAIYIYFLNAFSYWSRRGIPTIKPSFFGNVPMF TLRKSMGENVTDLYNRIKAPFFGMYVVFATPRLVIKDPQIVKLVKDFQHFQ DRGNEIDPEKNALVAHLFSLAGNHWNLRNALTPAFTSGKLVMMETITK CGENLQLYLEEKAKGQEVLEFKDLAARYTTDIISSVAMGIDVNSIKPNDEF RNIGRRIFDFSTTWEAIKNIMFFTSPEYLKTLNISVVKPDVHDFMTNVVEQT VNYREQSGVMRNDFMQLLIQLRNTGKIRDDDDMKVEIQEKQMSLEEITA EVHLFFLAGFETSSITMSSFFYEMARHPEIMRKAQAEVDSCVAKHGGFTY DAMNEMKYLENCINETLRIYALPFLRQCSIDYKIPGHDAVIPKGTIVLPL MGLHRDPEYFPDPLKYDPRFSDERKGSIVPYTYIPFGEGRACIGMRLG KMQVKVGLAMVLQKYDILKCKSTSTEFQHDPTTAGVVHLGGIWLKVA PRKQ			XP_026479659.1mC
Big 4 NW_020539725 - QVAO01003571	-56889288 - 56883820	3	CYP4193A1b	>Ctenocephalides_felis-3571-56889288-CYP4193A1b MAYVGLILAALLAIFMWCYRRSKEAQYQWNRGVAVPVPMMIFLGNLGR LTMRCFSHEMOKELYDEMKEYRYAGYEGARRLLMLIDEELVRTVLIKDFD YFCDRPTLDLREDNYLRHMLISLKGTHWKKVRSVMTPTFSSGKIRAMTEL LRHSKQIVQFLDERDVTGKNGHSVDLKDIFGRYAMDIIANCAFGVQCDS LTNPADFIQRASHIDEVSIPQRFLIFFVMICWPLARYVPLNMFHHTLQF LAEVVIQTRKYRELDTKNRRNDFLQLLLDAASSGTEESAVLSDDRVLVAQA LLFMIAGYETSSALSSTAYELARHPEIQEKVRQETAELGHDSPLYEMVILE AMRLHPTVARLDRSVTASYELDPSTGLILQPGDIVSINVIGMHFDERHFPE PNRYDPERFSPEEKAKRSPYVYLPFGAGPRNCIGARFAMLSIRLALSEILR VYFKVGDKTEIPMKLSTRSLLHKAANGVWVDIVPLQKEEK			<b>XP_026479918</b>
Big 4 NW_020539725 - QVAO01003571	+56993067 - 56998466	3	CYP4193A1a	>Ctenocephalides_felis-3571+56993067-CYP4193A1a MAYVGLILAALLAIFMWCYRRSKEAQYQWNRGVAVPVPMMIFLGNLGR LTMRCFSHEMOKELYDEMKEYRYAGYEGARRLLMLIDEELVRTVLIKDFD YFCDRPTLDLRDDNYLRHMLISLKGTHWKKVRSVMTPTFSSGKIRAMTEL LRHSKQIVQFLDERDVTGKNEHSVDLKDIFGRYAMDIIANCAFGVQCDS LTNPADFIQRASHIDEVSIPQRFLIFFVMICWPLARYVPLNMFHHTLQF LAEVVIQTRKYRELDTKNRRNDFLQLLLDAASSGTEESAVLSDDRVLVAQA LLFMIAGYETSSALSSTAYELARHPEIQEKVRQETAELGHDSPLYEMVILE AMRLHPTVARLDRSVTASYELDPSTGLILQPGDIVSINVIGMHFDERHFPE PNRYDPERFSPEEKAKRSPYVYLPFGAGPRNCIGARFAMLSIRLALSEILR VYFKVGDKTEIPMKLSTRSLLHKAANGVWVDIVPLQKEDK			<b>XP_026479926</b>
Big 5 NW_020537646 -							
Big 6 NW_020537758 - QVAO01001604.1	+4604584 - 4606129	4		partial gene : NNN gap into exons 6 to 10, exon 11 with frameshift	CYP4G273	CYP4G15 type	XP_026468386
Big 6 NW_020537758 - QVAO01001604.1	+4604622 - 4605786	4		exons 6 to 10	CYP4G273	CYP4G15 type	
Big 6 NW_020537758 - QVAO01001604.1	-4640653 - 4622724	4	CYP4G273a	>Ctenocephalides_felis-1604-4640653-CYP4G273a MSTEFEMNGGPTETLIQTGTASRAFMVLLFPALILWVYVWKLRRRMLLEL AERIPGPKGYPIGNLLDFVGSPPDIFSNINSSMEFDRIARVWVGPVLLV LFDPRDVEVVLGSHVYIDKSPEYRFFKFWLGNLLISTGHKWRSHRKLIA PTFHLNVLKSFIDLFNANSKAVVEKMKKEGSKTFDCHDYMSECTVEILLET AMGVSKKTQDRSGFEYAMAVMKMCDILHLRHTKVWLYPDLFLNLSKYAK EQVKLLDIHGLTKKVIKRSKKEEFAKGNRGLAINTYEELAKKVKKEDEKE KHLANGKTTTVEGLSFGQSAGLKDDLDDVDNDVGEKKRFLAFDLLLLSNQ NGVVISDTEIKEQVDTIMFEGHDTTAAAGSSFFLSLMIHQHQDRVIQELDE IFGSDRPAFQDTLEMKYLERCLMETLRMYPVPIIARQIQEDLKLVSQDF VVPAGCTVIVGTYKMHMPHEFPNPDVDFPDNFPERTANRHYAFVFPFS AGPRSCVGRKYAMLKILKILSTILRNRFRVHSDLTEKDFRLQADIILKRAEGFK VRLTPRKGSSVRLKA		CYP4G15 type	<b>XP_026468773</b>

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 6 NW_020537758 - QVAO01001604.1	-4666222 - 4652990	4	CYP4G273b	>Ctenocephalides_felis-1604-4666222-CYP4G273b MSTEFEMNGGPTETLIQTGTASRAFVMLLFPALILWVYVWKLRRRMLLEL AERIPGPKGYVIGNLLDFVGSPPDIFSNINSSMEFDRIARVWVWPKLLVF LFDPRDVEVVLGSHVYIDKSPEYRFFKPWLGNGLLISTGHKWRSHRKLIA PTFHLNVLKSFIDLNFANSKAVVEKMKKEGSKTFDCHDYMSECTVEILLET AMGVSKKTQDRSGFEYAMAVMKMCDILHLRHTKVWLYPDFLNLKSKYAK EQVKLLDIIHGLTKKIVRSKKEEFAKGNRGLAINTYEELAKKVEKEDEKE KHLANGKTTTVEGLSFGQSAGLKDDLDVDDNDVGEKKRLAFLDLLLESNQ NGVVISDTEIKEQVDTIMFEGHDTAAGSSFFLSLMGIHQHIQDRVIQELDE IFGSDSRPATFQDTLEMKYLERCLMETLRMYPVPIARQIQEDLKLVSQDF VVPAGCTVIVGTYKMRMPHFNPDPVDFPDNFLPERTANRHHYAFVPS AGPRSCVGRKYAMLKILSTILRNFRVHSDLTEKDFRLQADIIKRAEGFK VRLTPRKPQSSVRLKA		CYP4G15 type	<b>XP_026468774</b>
Big 6 NW_020537758 - QVAO01001604.1	+5441588 - 5442049	4		exons 10-11	CYP4G273	CYP4G15type	
Big 6 NW_020537758 - QVAO01001604.1	+5479518 - 5480055	4		exons 10-11	CYP4G273	CYP4G15type	
Big 6 NW_020537758 - QVAO01001604.1	-37451344 - 37451156	4		exon 11	CYP4G273	CYP4G15type	
Big 6 NW_020537758 - QVAO01001604.1	-40966521 - 40965056	4		partial exons 7gap-gap8-9-10gap-gap11	CYP4G273	CYP4G15type	
Big 6 NW_020537758 - QVAO01001604.1	+42093248 - 42093660	4		exon 10 (partial) - exon 11	CYP4G273	CYP4G15type	
Big 6 NW_020537758 - QVAO01001604.1	+44237359 - 44239765	4		exons 7 to 11	CYP4G274	CYP4G1type	
Big 6 NW_020537758 - QVAO01001604.1	+44234717 - 44239780	4	CYP4G274a	>Ctenocephalides_felis-1604+44234717-CYP4G274a MSMIESTTWGWMGLSSTPILAAALLVVSVAVYAIHYYQMQSRLRKLGDKI PGPPTVPFLGNALMALGKSPHEVLQTKMSMDIKDSVGRWFGNKLIVF LWHPDDVEIVLGSVHIDKSDEYRFFKPWLGNGLLISTGEKWRHRKLIAP AFHQNVLKSIFIRVFNNSRAVVQRLQKEVGKEFDVHDHLSQTTVDILLETA MGI SRKTHDQSGFDYAMAVMKMCEILHLRHYKWLWRFDTIFNWTNFAKKQ EQLLGIHGLTSKVLKKEEFIQNSIDGKYSPOYFKKITAETERENARELNT NQPKTGLRDDLDDIDENDVGEKRRLAFLDLMIESAQNGAPITDKEIKEQVD TIMFEGHDTAAGSSFFVMCLLGIHKDIQDKVYQEIYDIFGSDSRDCTFADTL QLKYLERYVIFESLRMYPVPIIARTLKQDVPLKSKNLVVPANCTVVIPTLKM HRNPDIFPNPDVFNPDNFPENSSSRHYYSYIPFSAGPRSCVGRKYAMLK LKVLISTILRNYRIKSNLTKDFVLQGGDIIKRTDGFRIEIEPRTTKVC		CYP4G1type	XP_026468846
Big 6 NW_020537758 - QVAO01001604.1	+ 44257623 - 44262265	4		pseudogene misses 2nd half of exon 3	CYP4G274	CYP4G1type	
Big 6 NW_020537758 - QVAO01001604.1	-44285521 - 44283483	4		exons 7 to 11,	CYP4G274	CYP4G1type	
Big 6 NW_020537758 - QVAO01001604.1	-44288271 - 44283467	4	CYP4G274b	>Ctenocephalides_felis-1604-4428827-CYP4G274b MSMIESTTWGWMGLSSTPILAAALLVVSVAVYAIHYYQMQSRLRKLGDKI PGPPTVPFLGNALMALGKSPHEVLQTKMSMDIKDSVGRWFGNKLIVF LWHPDDVEIVLGSVHIDKSDEYRFFKPWLGNGLLISTGEKWRHRKLIAP AFHQNVLKSIFIRVFNNSRAVVQRLQKEVGKEFDVHDHLSQTTVDILLETA MGI SRKTHDQSGFDYAMAVMKMCEILHLRHYKWLWRFDTIFNWTNFAKKQ EQLLGIHGLTSKVLKKEEFIQNSIDGKYSPOYFKKITAETERENARELNT NQPKTGLRDDLDDIDENDVGEKRRLAFLDLMIESAQNGAPITDKEIKEQVD TIMFEGHDTAAGSSFFVMCLLGIHKDIQDKVYQEIYDIFGSDSRDCTFADTL QLKYLERYVIFESLRMYPVPIIARTLKQDVPLKSKNLVVPANCTVVIPTLKM HRNPDIFPNPDVFNPDNFPENSSSRHYYSYIPFSAGPRSCVGRKYAMLK LKVLISTILRNYRIKSNLTKDFVLQGGDIIKRTDGFRIEIEPRTTKVC		CYP4G1type	<b>XP_026468844</b>
Big 6 NW_020537758 - QVAO01001604.1	-45330243 - 45330063	4		exon 11, with stop codon and frameshift	CYP4G273	CYP4G15type	
Big 7 NW_020539726 - QVAO01003572.1	+25503437 - 25507218	3		exons 3 to 10, stop codon in exon 4,	CYP4190A5		XP_026481487
Big 7 NW_020539726 - QVAO01003572.1	-25554419 - 25549925	3		partial gene, exons 1 to 10 but lacks exon 7	CYP4190A5		
Big 7 NW_020539726 - QVAO01003572.1	-25558575 - 25557480	3		exons 7 to 10	CYP4190A6		
Big 7 NW_020539726 - QVAO01003572.1	-25570211 - 25564696	3		>Ctenocephalides_felis-3572-25570211-CYP4190A5aP MFFVLIATLALFLGYIWHLGGHWARRKVPAPPESEFFGRWLKNITLAEHF GLLVHEAYKRFQDRPYFGTFSCFKPLFVVKDLDLVKTVLQTEFNSFQKND FDLNEELEPIFATNPFTQTGQRWKRRTQITPAFTSGRMKAMYPLMLEVG EKMNKYLEKNEKLPDGDVKEKLEKNEKAMDNVASCAGIDVESFQDQSDSDF IRAACKIFEPSFSNMIFLLTFMAPTITKILKFRIMPPETANFMSQIVNQNIKY REEHNITRDDFLQGMNLSRSKXQGEFPLTNKEMTGHAVSFLTDGYETS GVMAFTFFVVAKYKDIQNKLRREEIEEVLNKHGDMTYEAIKMEMSYLEKIIY ETMRMYPALMLQKRCCTQECTLPKGSSEDTLXQRDAVIVVYSFTXDPE FYSDPEKFDPERFSEEEKTSRHSYAFLLFGAGPRTCLGMRFALLQMKVAL MSAVKNFELSVNPKTKEPLVFDKSKSFTLRAKGLWIDFKKL	CYP4190A5aP	<b>Pseudogene:</b> four frameshifts at X	
Big 7 NW_020539726 - QVAO01003572.1	-25578858 - 25573268	3	CYP4190A6	>Ctenocephalides_felis-3572-25578858-CYP4190A6 MVFLLLIATLTLFLGYVWHVGSYWSKVKVPAPCPGESYARLWNTFLSEH FGLLLDKTYNFRRFQGGKPYFGAFSFFKPLFVIRDLDLVKTVLQTNFNSFQK NDFDIDELEPIFATNPFSQSGQKWKRSRTQITPAFTSGRMKAMYPLMIEV GDRMKYLEKNEGIEPIDTKSLSEKAMDNVASCAGIDVESFQDQSDSDF FIRVAKKIFEPSFTNMIKFLIAFMVPLSKILKIRLMPKETADFMTQIVTQNVK YREDHKIVRDDLQGMINSKGGQGEFPLTNLEMTGHAVSFLTDGYETS SAVMAFVYFAVAKHKHVQDKLRQELDVLKKHGQVTEYAIMEMQYLEQV LYETMRLYPPGMILQKRCCTQDC TIPGKSLGAEDITLREGDAVVIPLYSIQRD PEYYPDPEKFDPERFSEEEKTSRHSYAFLLFGAGPRTCLGMRFALLQMK VALMSAVKSFELSVNPKTKEPLVFDKSKSFTLRAKGLWIDFKKL			<b>XP_026481493</b>
Big 7 NW_020539726 - QVAO01003572.1	+28166551 - 28166715	3		exon 10	CYP4190A5		
Big 7 NW_020539726 - QVAO01003572.1	-29555000 - 29551400	3	CYP4190A4	>Ctenocephalides_felis-3572-29555000-CYP4190A4 MLWITLLAAALSLAYFYAKRTEHWSRKNLAKANTADTFFKDFNNITIKENF ANILDGYYKRFREEPFSGFAFFRPSLVLDLVIKTVLATDFTSFQKNDFE FDEELEVLLNTPFALSGAKWKFRANQVIPAFTSGRMKVMYPLMTEVAQK LTKYISEQNDATTSTGLDAKDLSEKAMDNVATCAFIDAESFTNPKSDFIR LGRKLFETTALNIIKFIIFMAPWLTLLRIRFVPKETSDDWVAVINQNVYRE KNNVSRDDLQGMNLRNKTIDYQPLTNLEMTGHLSFLTDGYETSSG VLAFALYAVAHNKDVQYLRREIEEVSEKYDGLNVEAIMEMHYLERIYET MRKYPPLMFMQKXCTQQCTLQGGNETLMEPDDSIMIPVMSIHNDPEY YDPERFDPRFTDDEKSARHPFAFLGFGGPRMCLGMRFALLQIKVALL HTVMNYELTVAPKTQNPILDKKAFLYKAEGGLWINFKLKN		frameshift at X but TSA GAYP02007449.1 shows X=R	XP_026481527

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 8 NW_020539724 - QVAO01003570.1	+978335 - 985744	mito	CYP315A1a	>Ctenocephalides_felis-3570+978335-CYP315A1a MLLEKCIKSGLRSCSTLARAELRGGLRDIPAPKGLPLLGLTLPQLLAAGSAS RLHEYIDNRHRSRSLGPFVREAVGPVRAVFLCDPDDMRAVFSRAEGRRRPR HVLPSDWLLHNRSGAERGLLFMDGEEWWHFRRMLNKLKMGKDLNWL GAPLDICLDKLDITDWGKDLQGTGESKNIVDLEQNLVRLSIDVMAALLGSAYK PSRDILEPTLEKFGRIVHEVFLHSAKLTVIPAEIAEKFLPAWRRFVRAVDTT LSLGNMNLVNLKIDECPEGDGLMAGMINEGVSRSDIQRIVTDLVIAAGDTTAF TTQWALLLLAKNSHQQNKVRNDILNGNRGLTKGVLRETLRLYPVATFITRF LAQDMLLGGYSIPEGLTICSLYTAGRDPENFARPEFLPERWCRNDALA GEGLLRAHASIPFALGSRSCIGQRIANMQIETLAKLLESFTIETCTNTNKIE MVMRMVAVPSEPVKLIKTKL			XP_026477073
Big 8 NW_020539724 - QVAO01003570.1	+1045035 - 1052503	mito		pseudogene, stop codon and frameshift in exon 1	CYP315A1		XP_026477076
Big 8 NW_020539724 - QVAO01003570.1	-1119248 - 1111795	mito	CYP315A1b	>Ctenocephalides_felis-3570-1119248-CYP315A1b MLLEKCIKSGLRSCSTLARAELRGGLRDIPAPKGLPLLGLTLPQLLAAGSAS RLHEYIDNRHRSRSLGPFVREAVGPVRAVFLCDPDDMRAVFSRAEGRRRPR HVLPSDWLLHNRSGAERGLLFMDGEEWWHFRRMLNKLKMGKDLNWL GAPLDICLDKLDITDWGKDLQGTGESKNIVDLEQNLVRLSIDVMAALLGSAYE PSRHILEPTLEKFGRIVNEVFLHSAKLTVIPAEIAEKFLPAWRRFVRAVDTT LSLGNMNLVNLKIDECPEGDGLMAGMINEGVSRSDIQRIVTDLVIAAGDTTAF FTTQWALLLLAKNSHQQHNVRNDILNGNRSLTKGVLRETLRLYPVATFITRF FLAQDMLLGGYSIPEGLTICSLYTAGRDPENFARPEFLPERWCRNDAL AGEGLLRAHASIPFALGSRSCIGQRIANMQIETLAKLLESFTIETCTNTNKIE MVMRMVAVPSEPVKLIKTKL			<b>XP_026477077</b>
Big 8 NW_020539724 - QVAO01003570.1	+10041417 - 10043830	4	CYP4VG1	>Ctenocephalides_felis-3570+10041417-CYP4VG1 MLFWLVLIFVLCFFAYFRLNRVRRFADKIPGEQPWPIAGNALDIGTDHTKLL QKLMQYLDKYKFSRFGIWLGMDFVFLVPEDDVEIILSNTTITKSKEYDFL HKWLGSGLLTSTGDKWRHSRKITPTFFHKILEEYAEVMNRCSDTLVKLE EHADGTVTDIHQFVSLCALDVVTE SAMGKINAQDQPN SAVVKSIDMCI LMQRTFSSWKRFGFLYKFSDFKLEQKALNIISTFNEKIVERSNLRNKKG IDNNEPNDTNSNDDDKISGMKRTAFLDMLTTTTDGENLPDQMIIRDEVA TFMFAGHDTTAAALAFGLYCLANYPEAQEKAFAEQFELFGSDRNKHPSTQ DFQNMKYLDRFIKEVLRVPSVPMIARKIETDNINGAIPTGAYVMIFIYAM NRNPKYFDDPERFDPDRFLPENRTNKHPIEYLAFSAGPRNCVQKGFALL EIKSVLSKVLNRNFELLSAGPENAVKIYDEVMTKSVNGAKIKIKLRNY			XP_026477215mN
Big 8 NW_020539724 - QVAO01003570.1	+10045263 - 10049724	4	CYP4VG2	>Ctenocephalides_felis-3570+10045263-CYP4VG2 MMFCLLIVLIMVFTVYVYTRINRVRRYADKLPGETPWPIVGSFAVEGTDVPV EFLRWLMVLWLNKYNRKLFGLWGMDFVFLVTPDDVEVILSSTTHITKMR DYQFLEPWLGSLLTSSGNKWRHSRKITPTFFHKILEEYAEVFNRCSDIMI KKLSDKADGRVVDIYQYVTLCAVATESAMGKINAQDQDPSDIDVRSIYDV CYVMQGRGFSAWKRFEALFRLSVCYRLQKALSIIFSFNDKVLNRAQLIR ENPHLITEHVENDGSKTKKTAFLDMLTTTTIEGKNLPDKMIRDEVATFMF EGHDTTAAALAFGLYCFKAKNPEVQKALEEQIAIFGTDKHQHPSYKDFND MKYLDRFIKETLRVPSVPIIGRLAEEDIDLNGKLIPAGADLVILIYAMNRPD IYENPEHFDPRFLPENRTNKHPIEYVYVFSAGPRNCIGQKFALELKSVM SKMLRNIEILPAGPENIEVYAEVTLKSKNGVSVRLSPRKL			XP_026477215mC
Big 9 NW_020539727 - QVAO01003573.1	+2296227 - 2299213	3	CYP9FH1a	>Ctenocephalides_felis-3573+2296227-CYP9FH1a MWGLLSLGLIFLLWVYKYATWTFDRFKGTNPVYLPKVALIGNSLKFLKQE DMIESIGKPYTKFPARFVGFQMRPLPSIMIRDPELIRQVAVKDFDSFTNHR PFVDPALPEPLFGSSLLKDKQWRDMRSTLSPAFTGSKMRLMYEFIECAE QLTDHLHEEVEKGTLDLEVKELVTKYANDVIASSAFGIKVDTLKDPDNIFY KMGRKVSNSFGFWVSLKFFAFLLIPHIMRVLRLITLDDQDCGKFFRVLVHDT MDEREKKGIVRPDMINLLMQAKKGLKHEADVDESSGFATVTESSITKSS THKRVSDDIEITGQAMIFFLAGFESISTISCFVAYELAINPEVQKTLQDEIDA VCVELEQSNQKLVYERLHKMKYLDMVISSEGLRKWPAAPFTDRVCNNGY TLEDYEGNKFEVKKGEALMIPYNIHHDEQYYENPHKFDPERFSEDNKQNI KPFTYMPFGVGRNCIGSRFALMEMKALLFNILKEFDIVPSEKTIQIPLKLSR NSIQMRPEKGFWMKLPKRSRN			XP_026482122mN
Big 9 NW_020539727 - QVAO01003573.1	+2304820 - 2309460	3	CYP9FH4a	>Ctenocephalides_felis-3573+2304820-CYP9FH4a MIALILLGAILLWRLYKYGTWTFDRFKGTNPVYLPKVPVFIGNSLKFLRQED MIESMGRSYIAFPNHRFVGNFQMGRLPSVLLRDPPELIRQVAVKDFDFTNHR RVFFDPAEPLFGSSLLFALQDQKWRDMRATLSPAFTGSKMRLMYEFIECAE AQQLTDHLHEEVEKGTLDLEIKDLVTRYANDVIATSAGFIKVDTLKDPDNE FYRMGKVTNFSGVLVNLKFAAFLMMPQVMKFFKITLLNQECGQFFRXTL VHGTMDEREKQIVRPDMIHLLMQARRGALKHDAGADATQDTGFATVTE SSITKPTPKRAWNSDEITGQALLFFLAGFESISTASFCIAYELAINPDVQKT LQDEIDEVCELEQSNQKLVYERLHKMKYLDMVISSEGLRKWPAAPFTDRVCN RVCVNGYSLEDYEGNKFEVKKGEAVLFPYNIHHDEKYYDNPDKFDPSRF SEENKNNIKPFTYMPFGVGRNCIGSRFALMEMKALLFNILKEFDIVPSEKTIQIPLK LAKSAVQMKPENGFWIKLQPRKIN		indel (fs) of 17 nt at FFRXTLVHG. transcripts do not have this indel	XP_026482122mC
Big 9 NW_020539727 - QVAO01003573.1	+2318530 - 2324061	3	CYP9FH2b	>Ctenocephalides_felis-3573+2318530-CYP9FH2b MLEYILLVAVLLFALYIYGTWTFDRFKGTNPVYLPKVPVVLVGNLSLKALRMEN IESIGRSYDAFPQSRFVGFQMRFLSVLLRDPPELIRQVAVKDFDFTNHRP FFDQVDEPLFGSSLLFALQDQKWRDMRATLSPAFTGSKMRLMYEFIECAE QITHYLHQEVNKKGALDLEVKDLVTKYANDVIATSAGFIKVDLSDKDPENIFY RMGKRVTNFSGVLVSLKFFAFMMLPRVMKFFRVSLLDRTCGQFFRXTL TMETREEQIVRPDMIHLLMQAKKQALQDAAGDVAHDAGFATVTE KTHTPRRVWSNDEITGQALLFFLAGFETISTASFTAYELAINPDVQKT EIDAVCEELKQSNHKNVDYERLHKMKYLDMVISSEGLRKWPAAPFTDRVCN NRYLLEDHNGNKYEVKKGETLFIYIHHDEKYYDNPDKFDPNRFSEENK HNKIPFTYMPFGVGRNCIGSRFALMEMKALLFNILKEFDIVPSEKTIQIPLK LAKSAVQMKPENGFWIKLQPRKIN			<b>XP_026482123</b>
Big 9 NW_020539727 - QVAO01003573.1	-2634415 - 2628568	3	CYP9FH2a	>Ctenocephalides_felis-3573-2634415-CYP9FH2a MLEYILLVAVLLFALYIYGTWTFDRFKGTNPVYLPKVPVVLVGNLSLKALRMEN VIESIGRSYDAFPQSRFVGFQMRFLSVLLRDPPELIRQVAVKDFDFTNHRP PFFDQVDEPLFGSSLLFALQDQKWRDMRATLSPAFTGSKMRLMYEFIECAE EQITHYLHQEVNKKGALDLEVKDLVTKYANDVIATSAGFIKVDLSDKDPENIFY YKMGKRVTNFSGVLVSLKFFAFMMLPRVMKFFRVSLLDRTCGQFFRXTL HDTMETREEQIVRPDMIHLLMQAKKQALQDAAGDVAHDAGFATVTE AITKTHTPRRVWSNDEITGQALLFFLAGFETISTASFTAYELAINPDVQKT QEEIDTVCEELKQSNHKNVDYERLHKMKYLDMVISSEGLRKWPAAPFTDRVCN NRYLLEDHNGNKYEVKKGETLFIYIHHDEKYYDNPDKFDPNRFSEENK ENKHNKIPFTYMPFGVGRNCIGSRFALMEMKALLFNILKEFDIVPSEKTIQIPLK LAKSAVQMKPENGFWIKLQPRKIN			<b>XP_026482127</b>

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
Big 9 NW_020539727 - QVAO01003573.1	-2671637 - 2665699	3	CYP9FH4b	>Ctenocephalides_felis-3573-2671637-CYP9FH4b MIALILLGAILLWGLYKYGTWNYDRFKGTIAPYIEPVPFIGNSLKFILRQEDMI ESMGRSYTAFPNHRFVGNFQMGFLPSVLLRDPPELIRQVAVKDFDNFNP VFFDPAAEPLFGSSLFALQDQKWRDMRATLSAFTGSKMRLMYEFIECA QQLTDHLHEEVSKKGLDLEIKDLVTKYANDVIATSAFGIKVDLTKDPDNEF YRMGKVTNFSGLVNLKFAAFLLMMPQVMKFFKITLLNQECGQFFRFLVH GTMDEREKQGIVRPDIHLLMQARXGALKHDAGADATQDTGFATVTESSI TKTPTPKRAWSNDEITGQALLFFLAGFESISASTCFIAYELAINPDVQKTLQ DEIDEVCEDLEQSNQKLVDERLHMKMYLDMVVSEGLRKPWPAAPFTDRV CVNGYSLEDYEGNKFEVKKGEAVLFPYIYNIHHDEKYDNPDKFDPFRS ENKNNIKPFTYMPFGVGRNCIGSRFALMEMKTLNLFNLFKFDIVPSEKTQI PLKLAKGLMQMKPEKGFVWVVKLQPRKTRK		frameshift at X, but TSA GAYP02014785.1 shows X= R	XP_026482128
Big 9 NW_020539727 - QVAO01003573.1	-2688928 - 2683039	3	CYP9FH3	>Ctenocephalides_felis-3573-2688928-CYP9FH3 MIALILLGAILLWGLYKYGTWNYDRFKGTIAPYIEPVPFTGNSLKFILRQEDMI ESMGRSYTAFPNHRFVGNFQMGFLPSVLLRDPPELIRQVAVKDFDNFNP VFFDTSADPLIGSSLSVLQKWRDMRATLSAFTGSKMRLMYEFINECA QQLTDHLHEEVSKKGLDLEIKDLVTKFANDVIATSAFGIKVDLTKDPDNEF YKMGKVTNFSGLVNLKFAAFVMMQVMKFFKMTLLDQECGQFFRFLVH HGTMDEREKQGIVRPDIHLLMQARRGALKHDAGADATQDTGFATVTESS SITKTPTPKRAWSNDEITGQALLFFFTGFETISASTCFIACELAINPDVQKTL QDEIDEVCENLEQSNKLVDESLHQMKYLDMVVSEGLRKPWPAAPFTDRV VCVNGYSLEDYEGNKFEVKKGETVLFPIYNIHHDEKYDNPDKFDPFRS EENKNNIKPFTYMPFGVGRNCIGSRFALMEMKTLNLFNLFKFDIVPSEKT QIPLKLAKGLMQMKPEKGFVWVVKLQPRKTRK			XP_026482201
Big 9 NW_020539727 - QVAO01003573.1	-2705927 - 2701098	3	CYP9FH1b	>Ctenocephalides_felis-3573-2705927-CYP9FH1b MWGLLSLGAFLWVYKYATWTFDRFKGTNVPYMKPVALIGNSLKFLKQ EDMIESIGKPYTKFPRARFVGFQMRPLSIMIRDPELIRQVAVKDFDFTNH RPFVDPALPLFGSSLFLLKQKWRDMRSTLSAFTGSKMRLMYEFIECA EQLTDHSHEEVEKGLDLEIKDLVTKYANDVIASSASSAFGIKVDLTKNP DNIFYKMGGRKVSNFSGFVWVSLKFFAFLIPHMVRLRITLLDQDCGKFFRFL VHDTMDEREKQGIVRPDIHLLMQAKIGGLKHEVDVDESSGFATVTESSI KSSTHKRVWSDDEITGQAMIFFLAGFESISASTCFIAYELAINPDVQKTLQD EIDAVCVLEQSNQKLVDERLHMKMYLDMVISXGLRKPWPAAPFTDRV NGYTLDEYDGNKFEVEKGEALMIPYIYNIHHDEKYDNPDKFDPFRS EENKNNIKPFTYMPFGVGRNCIGSRFALMEMKTLNLFNLFKFDIVPSEKTQI PLKLAKGLMQMKPEKGFVWVVKLQPRKTRK		frameshift at X, but TSA GAYP02006496.1 shows X=E	XP_026482129
Big 9 NW_020539727 - QVAO01003573.1	+25463321 - 25478683	4	CYP4VH1a	>Ctenocephalides_felis-3573+25463321-CYP4VH1a METYGREGPFRIWFGHQLYVIVCKPKDIQVNLKALQKGDVYRFSEPWG HGLFTAPVSKWRSSRKLSPAFNMKVLGFPVFPVQQNRILVEKLRDVA KELAVDMFGYVSAATLDVICETAMGTRLHAQNDTTYTKLAQRTLKIESER MYNIFYYPDFIFYKSLAGKEFMKGIYFRDLTDKVIKRRKLELNEKEKSTSF AAGTESEKLVYNNAKNLERERAERDDDDIPLFTRKRKAFLDLLFEYTKQE GQWTDQQLNDEVSTMMIAGNDTTATVACFTMMMLGIHKSQDLVNL KEIFSGPDRNRDPEISDLQNMVYLDLAIKEMRLFPVGFIVRKCMEIKLE SCTIPKASIGIGIFGLHRDPELWPEPEQFRPERFANGASSYETVGVQNG YATTNGKIIQNGDVKSIAINDVKNENEFNEIKTTNPNVNGSDGYSMNDNS EKSIFNKPRHPYAYIPFSAGPRNCIGIKYAKISLMMMLSSILRNYEISCDYKIK DIKLNQDIIKLPSEGYVIVKLRHKL			XP_026482628
Big 9 NW_020539727 - QVAO01003573.1	+25532707 - 25547129	4	CYP4VH1b	>Ctenocephalides_felis-3573+25532707-CYP4VH1b METYGREGPFRIWFGHQLYVIVCKPKDIQVNLKALQKGDVYRFSEPWG HGLFTAPVSKWRSSRKLSPAFNMKVLGFPVFPVQQNRILVEKLRDVA KELAVDMFGYVSAATLDVICETAMGTRLHAQNDTTYTKLAQRTLKIESER MYNIFYYPDFIFYKSLAGKEFMKGIYFRDLTDKVIKRRKLELNEKEKSTSF AAGTESEKLVYNNAKNLERERAERDDDDIPLFTRKRKAFLDLLFEYTKQE GQWTDQQLNDEVSTMMIAGNDTTATVACFTMMMLGIHKSQDLVNL KEIFSGPDRNRDPEISDLQNMVYLDLAIKEMRLFPVGFIVRKCMEIKLE SCTIPKASIGIGIFGLHRDPELWPEPEQFRPERFANGASSYETVGVQNG YATTNGKIIQNGDVKSIAINDVKNENEFNEIKTTNPNVNGSDGYSMNDNS EKSIFNKPRHPYAYIPFSAGPRNCIGIKYAKISLMMMLSSILRNYEISCDYKIK DIKLNQDIIKLPSEGYVIVKLRHKL			XP_026481939
other scaffolds:							
QVAO01000097.1	-8231 - 5501	mito	CYP12AH2b	>Ctenocephalides_felis-0097-8231-CYP12AH2b MFCTKSSRLCNAASHLNLLEIYTLTRNFSEITVLLATSPVLKKTQISWHEA KPYCEIPGPKSALKSIRNPLPGGKYKISLKDHLHILLNEECGDLVRLKGLG RPFDFILSFNPEDFEQIYRNEGPWPNRREFETFKHFRKRLRPDIYGDNAGL LVEHGEKWKELRGKVNPMQPRVVIKPYVVPVEEVAEEFIERMLHLRDSN NKLPNDFSKELNKWALESIARIALDSRLGCLADDSEMNYDSKIMIQAVHDF FHLTFKLEVLPSLWRYIKTPAYTKLMAALDVMNTNLSKIDEAIIIRNNTNSE SESEISVLEKLLKIDKNVAIIMADMMLLAGIDTTSNTTAILLYFLAANQRCD KLREEIFTILPKDSQLKNSDFNHIPYLRACMKEANRILPIAGGTIRKLAENV VLSGYQIPNGNEVVMShLTSLRENQFSNPKTYLPERWLTGAAAGGCP AKSAHPFVHMPFGFGRSCVGRFADLEVETLIVKLLRNYKVEWSYGD VETKLLTIPVSPKFKITEL			
QVAO01000097.1	-16485 - 14253	mito		complete pseudogene, multiple frameshifts	CYP12AH3		
NW_020536278.1 QVAO01000124.1	+929 - 5458	mito	CYP302A1b	>Ctenocephalides_felis-0124+929-CYP302A1b MIRLKKQFSYKSFVSLRNLSTSSVKEPRPFNEIPGPKPIPVGLTLMWY PIIGYRWSALHHTGMKYYKTWGLIREPVAPGVTLWVYEPDDIATILRD EGQNFPERRSHLALQKFRDRPHVYNSGGLLPTNGAEWVKLRSEFQK GLSAPHCARQFFKSADQITSEFCHHINEIASDCKDFLPEISRLNLELVCYMA FDRMNSFSKEELDSHSRSSLKAAEDTNSCILGTDQIGLWKFIPITLKY KKLERAQKYMESVAVDLVSQKFSYTDATAESGSKSLENYIYNPKLDFR DIIGMAADLLLAGVDTSYATSFALYHLAINPHVQEKLYEESLKILETKNSPM TLESFQNASYARAVLKESSLRNPISVGVGRIKKDITLSGYHIPAGTVAVTQN QVICRLEKNFPEADKFLPERWLKSNKSVSRMRNKDSQNFTNEINKFDIKD TFQVPHPLSLPFGYGMRSVARRFAEQNIQVLLLRIRNFIEISWGTTLD SKTFLINKPDQPLNFKFRRLSN			XP_026472738
NW_020537187.1 QVAO01001033.1	-6046 - 3428	3	CYP6WN1b	>Ctenocephalides_felis-1033-6046-CYP6WN1b MIFLNNVLTVAIIIVIIIVSYFLSYFTYWKRKDVPIYQPSFPPFNISAMFFR KQSMQVMSNLYNSVQKPFYVFLFPRLVKDPPELIKIMIMVKDFQNFQ NRGNEFDPKTNALASNLFSLSGEAWVKLRNVLSPAFTSGKLVMMETITK CGEQLQEHLSEKAKNSEVVEFKDLAARYTTDIIASVAFGIDVNSVKNPDE FRQIGKIFQVSNYKDFIVKLLFHNCPELINLLRISINADVYKFMINIVQI LREKKGVVVRNDFMQMLIQLRNSGKVNEDDGMKVKIKDAKLLSIEAIAEAR LFLAAGFETSSMTSSFFYEISQNPYIMKKVQNEIDTCVKRYGGFTYEALN DMKYLENCISETLRLYPVPLSLTRECLTDYKIPGSKTVIPKGRVLIPLGLQ RDPKYFSNPEKFDPRFSDDRKDSITPYTYPFGEGRACIGMRLAKLQ MKVGLAMTLYKFDILKSAKTSQKFRHDPESGVSLLGGIWLQIAHRK			XP_026462801

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
NW_020537187.1 QVAO01001033.1	-9367 - 7017	3	CYP6WN2c	>Ctenocephalides_felis-1033-9367-CYP6WN2c MFDFIQYVFEVLVAVLVLVAATYVYFKHSFTFWEKRNIPSIAPTFPFGNVE PVFRSCKSMSQNIADLYNSIKAPFFGIYVFCIPRLVVKDPELIKLVKDFQYF QNRGNEFDSKSNALQSNLFSISGDSWQKLRNALSPAFTSGKLLKAMMEIIR CGKNLQEFLEEKSNKEEFKDLAARYTTDVISSVALGNEVNSVKNPNH EFREIGRKIFNLPTTRWDVMSIMFFMSPEILNKFLANISREYDFMNNVV RQTVTFREENNITRPFDMQLLIQLRNGGEITDDDDMKIKVQGEKQLSLDAI ASEVNLFFLAGFETSSITMSSFFYEMAQNHDIMRKAQADIDASVAKHGGF NYEAMNDMKYLENCINETLRIYTTLPFLVRECSIDYKIPGHNAFIPKGRVLI PLMGLHRDPDHFNPMPKDFDRFSDERKGSIKPYTYFPFGGKCRACIGM RLGKMQVKMGLAMVLHKFDILKCKSTSEEFQHDPTTAGVVHLGGIWLKVA KRKV			XP_026462802mC
NW_020537187.1 QVAO01001033.1	-12694 - 10144	3	CYP6WN3c	>Ctenocephalides_felis-1033-12694-CYP6WN3c MALIFDVTLDITAVIFAIYIYFLNAFSYWSRRGIPTIKPSFPFGNVAPMF TLRKSMDGENVTDLYNKIKAPFFGMYVFATPRLVIKDPQIVKLVKDFQHFQ DRGNEIDPEKNALVAHLFSLAGNHWNLRNALTPAFTSGKLLKMMNTVIK CGENLQIYLEEKAKGQEVLEFKDLAARYTTDISSVAMGIDVNSIKNPDEF RNIGRRIFDFSTTWEAVKNIMFFTSPEYLKTLNISVVKPDVHDFMTNVVEQ TVNYREQSGVMRNDFMQLLIQLRNTGKIRDDDDMKVEIQKEKQMSLEEIT AEVHLFFLAGFETSSITMSSFFYEMARNPEIMRKAQAEVDSCVAKHGGFT YDAMNEMKYLENCINETLRIYALPFLLRQCSIDYKIPGHDAVIPKGRVLI LMGLHRDPEYFPDPLKYDPRFSDERKGSIVPYTYIPFGGKCRACIGMRL GKMQVKVGLAMVLQKYDILKCKSTSTEFQHDPTTAGVVHLGGIWLKVAPR KQ			XP_026462802mN
NW_020537190.1 QVAO01001036.1	-1243 - 1	3		exon 1 with 2 frameshifts, partial exon 2 to edge of scaffold	CYP6WN1		
NW_020537190.1 QVAO01001036.1	-4560 - 2212	3	CYP6WN2b	>Ctenocephalides_felis-1036-4560-CYP6WN2b MFDFIQYVFEVLVAVLVLVAATYVYFKHSFTFWEKRNIPSIAPTFPFGNVE PVFRSCKSMSQNIADLYNSIKAPFFGIYVFCIPRLVVKDPELIKLVKDFQYF QNRGNEFDSKSNALQSNLFSISGDSWQKLRNALSPAFTSGKLLKAMMEIIR CGKNLQEFLEEKSNKEEFKDLAARYTTDVISSVALGNEVNSVKNPNH EFREIGRKIFNLPTTRWDVMSIMFFMSPEILNKFLANISREYDFMNNVV RQTVTFREENNITRPFDMQLLIQLRNGGEITDDDDMKIKVQGEKLSLDAIA SEVNLFFLAGFETSSITMSSFFYEMAQNHDIMRKAQADIDASVAKHGGFN YEAMNDMKYLENCINETLRIYTTLPFLVRECSIDYKIPGHNAFIPKGRVLI LMGLHRDPEYFPDPLKYDPRFSDERKGSIVPYTYIPFGGKCRACIGMRL LGKMQVKMGLAMVLHKFDILKCKSTSEEFQHDPTTAGVVHLGGIWLKVAK RKV			
NW_020537190.1 QVAO01001036.1	-7758 - 5171	3		pseudogene, 4 frameshifts in exon 1, 1 in exon 2, 1 in exon 3	CYP6WN3		
NW_020537190.1 QVAO01001036.1	-13582 - 10968	3	CYP6WN1c	>Ctenocephalides_felis-1036-13582-CYP6WN1c MIFLNNVLTVIIIIIVIIIVISYFLYSFTYWKRRDVPYIQPSFPFGNISAMFFR KQSMQVMSNLYNSVQKPFYVFLFPRLVVKDPELIKIMVDFQNFQ NRGNEFDPKTNALASNLFSLSGEAWVKLRNVLSAFTSGKLLKMMMETITK CGEQLQEHLEKAKNSEVVEFKDLAARYTTDIASVAFGIDVNSVKNPDDE FRQIGKKIFQVSNYKDFIVKLLFHNCPELINLLRISINADVYKIFIMNIVQQIVT LREKKGVVVRNDFMQMLIQLRNSGKVNEDDGMKVKIKDAKLLSIEAIAAEAR LFLAAGFETSSMTMSSFFYEISQNPYIMKKVQNEIDTCVKRYGGFTYEALN DMKYLENCISETLRLYPVLLSLTRECLTDYKIPGSKTVIPKGRVLIPLGLQ RDPKYFSNPEKDFDRFSDDRKDSITPYTYMPFGGRRACIGMRLAKLQ MKVGLAMTLYKFDILKSAKTSQEIRHDPESGVSLLGGIWLQVAHRK			
NW_020537190.1 QVAO01001036.1	-16898 - 14550	3	CYP6WN2d	>Ctenocephalides_felis-1036-16898-CYP6WN2d MFDFIQYVFEVLVAVLVLVAATYVYFKHSFTFWEKRNIPSIAPTFPFGNVE PVFRSCKSMSQNIADLYNSIKAPFFGIYVFCIPRLVVKDPELIKLVKDFQYF QNRGNEFDSKSNALQSNLFSISGDSWQKLRNALSPAFTSGKLLKAMMEIIR CGKNLQEFLEEKSNKEEFKDLAARYTTDVISSVALGNEVNSVKNPNH EFREIGRKIFNLPTTRWDVMSIMFFMSPEILNKFLANISREYDFMNNVV RQTVTFREENNITRPFDMQLLIQLRNGGEITDDDDMKIKVQGEKQLSLDAI ASEVNLFFLAGFETSSITMSSFFYEMAQNHDIMRKAQADIDASVAKHGGF NYEAMNDMKYLENCINETLRIYTTLPFLVRECSIDYKIPGHNAFIPKGRVLI PLMGLHRDPDHFNPMPKDFDRFSDERKGSIVPYTYIPFGGKCRACIGM RLGKMQVKMGLAMVLHKFDILKCKSTSEEFQHDPTTAGVVHLGGIWLKVA KRKV		frameshift at X, but tsa shows X=K	XP_026462807mC
NW_020537190.1 QVAO01001036.1	-20121 - 17510	3	CYP6WN3b	>Ctenocephalides_felis-1036-20121-CYP6WN3b MALIFDVTLDITAVIFAIYIYFLNAFSYWSRRGIPTIKPSFPFGNVAPMF TLRKSMDGENVTDLYNKIKAPFFGMYVFATPRLVIKDPQIVKLVKDFQHFQ DRGNEIDPEKNALVAHLFSLAGNHWNLRNALTPAFTSGKLLKMMNTVIK CGENLQIYLEEKAKGQEVLEFKDLAARYTTDISSVAMGIDVNSIKNPDEF RNIGRRIFDFSTTWEAIKNIMFFTSPEYLKTLNISVVKPDVHDFMTNVVEQ TVNYREQSGVMRNDFMQLLIQLRNTGKIRDDDDMKVEIQKEKQMSLEEITA EVHLFFLAGFETSSITMSSFFYEMARHPEIMKKAQAEVDSCVAKHGGFTY DAMNEMKYLENCINETLRIYALPFLLRQCSIDYKIPGHDAVIPKGRVLIPL MGLHRDPEYFPDPLKYDPRFSDERKGSIVPYTYIPFGGKCRACIGMRLG KMQVKVGLAMVLQKYDILKCKSTSTEFQHDPTTAGVVHLGGIWLKVAPR KQ			XP_026462807mN
NW_020537337.1 QVAO01001183.1	+3032 - 8999	3	CYP9FH4c	>Ctenocephalides_felis-1183+3032-CYP9FH4c MIALYXGAILLWGLYKGTWNYDRFKGTIAPYIEPVFIGNSXKFLRQED MIESMGRSYTAFNHRFVGNFQMLPSVLLRDPQLRQVAVKDFDNFNP RVFFDPAAEPLFGSSLFALQDQKWRDMRATLSPAFTGSKMRLMYEFIEC AQQLTDHLHEEVSKKGLDLEIKDLVTKYANDVIATSAFGIKVDTLKDPDNE FYRMGKVTNFSGVLVNLKFAFLMMPQVMKFFKITLLNQECGQFFRTL HGTMDEREKQGIVRPMIHLMLQARRGALKHDAGADATQDTGFATVTE SITKTPTPKRAWNSDEITGQALLFFLAGFESISASTCFIAYELAINPDVQKTL QDEIDEVCEDELEQSNQKLVYERLHKMKYLDMMVSEGLRWPAAPFTDR VCVNGYSLEDYEGNKFEVKKGEAVLFPYIYNIHDEKYYDNPHKFDPSRFS EENKNIKPTYMPFGVGRNRCIGSRFALMEMKTLFFNILKEFDIVPSEK QIPLKLAQGLMQMKPEKGFVVKLQPRKTRK		frameshifts at X but TSA shows X1 L X2=L	XP_026465830
NW_020537337.1 QVAO01001183.1	+18941 - 24496	3		pseudogene, with 4 frameshifts, last exon off scaffold edge.	CYP9FH2		
NW_020537633.1 QVAO01001479.1	+17093 - 23694	mito		partial pseudogene, stop codon in exon 4	CYP49A1		
NW_020537633.1 QVAO01001479.1	+35585 - 46239	mito		last 3 exons of 11 missing	CYP49A1		
NW_020537859.1 QVAO01001705.1	+20709	2		3 C-end exons with frameshifts	CYP304U1		XP_026470216
NW_020537859.1 QVAO01001705.1	+26722	2		3 middle exons with frameshifts	CYP304U1		
NW_020537722.1 QVAO01001568.1	-12851 - 9794	2		partial gene, exon 1 missing,	CYP18A1		

Scaffold	Position	CYP clan	CYP name	Sequence	Fragment(s) matches:	comment	best RefSeq match (bold is confirmed by manual curation)
NW_020539316.1 QVAO01003162.1	+105 - 1082	3		exons 8 -9 -10, with frameshift in exon 8	CYP4192A1		XP_026476322
NW_020539316.1 QVAO01003162.1	+14574 - 18504	3	CYP4192A1b	>Ctenocephalides_felis-3162+14574-CYP4192A1b MIILSLVMILMTLVYVHYKYTFGQFRWRRVPHEKGLPLVGNMLDCILQKRHI IDVMHEIYQKFPDFPYFGFYRFCTPVFVIRDLQLARQILVKDFNYFKDLDLH CTDDDILLKKNIFMMKGEKWREYREKVAPMLSSGKIRLVFPLYKTCDLV KHIRNAEGSSTTGLETRELSNKYTTTEVIASCAFGLANCLNNFREDISIFRE MGKKIFEPTTWTSSINITLVTAVPILSKFINIRFVPELVTDWIKMVQDTVQYRK DNKIKRDDFXLQNLMLQLHDQTDGQKFTMEDIAAQCTSFLLDGFETSGSVI CLALYEIAKNPDVQERMVKEIEEVLKGHEXKVTDAMIEMTYLDAVINETLR KWPIVAAFPRTCTEDYELPPFEGGPKRAIGIKRGDSVHVAIGSFHKDPQYF SNPDKFDPSRFFEGSTETFTKDAFFPWGAGPRLCLGQRFQFLQIKTSVMA VRSFKLKISEGKDADPKLDRSFMPLRVGGAWITYTPR		2 frameshifts at X but TSA GAYP02016187.1 shows X1=- X2=N	
NW_020539637.1 QVAO01003483.1	+299 - 1399	3		exons 7-10 at scaffold edge, with 2 frameshifts	CYP4190A6		XP_026476625
NW_020539637.1 QVAO01003483.1	+ 4515 - 10006	3	CYP4190A5b	>Ctenocephalides_felis-3483+4515-CYP4190A5b MFFVLIATALALFLGYIWLGGHWARRKVPAPPEPSEXFGRWLKKNITLAEHF GLLVHEAYKRFQDRPYFGTFSCFKPLFVVKDLDLVKTVLQTEFNSFQKND FDLNEELEPIFATNPFTQTGQRWKRSTQITPAFTSGRMKAMYPLMLEVG EKMNKYLEKNEKLPDGIDVKELNEKFAMDNVASCAGIDVESFQDQSDSF IRAACKIFEPSFSNMIKFLTFMPTITKILKFRIMPPETANFMSQIVNQNIKY REEHNITRDDFLQGMNLSRSKTQGEFPPLTNKEMTGHAVSFLLDGYETSS GVMAFTFFVAKYKDIQNKLRREEIEEVLNKHGDMTYEAIMEMSYLEKIYE TMRMYPPALMLQKRCTQECTLPKSSDITLHPGDVAVIPVYSIHHDPEFY SDPEKFDPERFSEEEKTSRHSYAFGLFGAGPRTCLGMRFALLQMKVALM SAVKNFELSVNSKTKLEPLVFDKSKSFTLRAKGLWIDFKKL		frameshift at X but tsa shows X=F	XP_026476627