

## GEPHE SUMMARY

**Gephebase Gene**  
CYP6B4

**Entry Status**  
Published

**GepheID**  
GP00000206

**Main curator**  
Martin

## PHENOTYPIC CHANGE

### Trait #1

**Trait Category**  
Physiology

**Trait**  
Xenobiotic resistance

**Trait State in Taxon A**  
Other butterflies

**Trait State in Taxon B**  
Papilio glaucus and Papilio canadensis

### Trait #2

**Trait Category**  
Physiology

**Trait**  
Host plant specialization

**Trait State in Taxon A**  
-

**Trait State in Taxon B**  
-

**Ancestral State**  
Data not curated

**Taxonomic Status**  
Intergeneric or Higher

### Taxon A

**Latin Name**  
*Nymphalidae*

**Common Name**  
brushfoots

**Synonyms**  
brushfoots; brush-footed butterflies

**Rank**  
family

**Lineage**  
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphimesnoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Papilionoidea

**Parent**  
Papilionoidea (butterflies) - (Rank: superfamily)

**NCBI Taxonomy ID**  
33415

**is Taxon A an Intraspecies?**  
No

### Taxon B

**Latin Name**  
*Papilio glaucus*

**Common Name**  
eastern tiger swallowtail

**Synonyms**  
Pterourus glaucus; eastern tiger swallowtail; tiger swallowtail; Papilio glaucus Linnaeus, 1758

**Rank**  
species

**Lineage**  
cellular organisms; Eukaryota; Opisthokonta; Metazoa; Eumetazoa; Bilateria; Protostomia; Ecdysozoa; Panarthropoda; Arthropoda; Mandibulata; Pancrustacea; Hexapoda; Insecta; Dicondylia; Pterygota; Neoptera; Holometabola; Amphimesnoptera; Lepidoptera; Glossata; Neolepidoptera; Heteroneura; Ditrysia; Obtectomera; Papilionoidea; Papilionidae; Papilioninae; Papilionini; Papilio

**Parent**  
Papilio () - (Rank: genus)

**NCBI Taxonomy ID**  
45779

**is Taxon B an Intraspecies?**  
No

## GENOTYPIC CHANGE

**Generic Gene Name**  
CYP6B4

**UniProtKB** Papilio glaucus  
Q27902

**Synonyms**

-

**GenebankID or UniProtKB**

U65489

**String**

-

**Sequence Similarities**

Belongs to the cytochrome P450 family.

**GO - Molecular Function**

GO:0020037 : heme binding

GO:0005506 : iron ion binding

GO:0070330 : aromatase activity

**GO - Biological Process**

-

**GO - Cellular Component**

GO:0005789 : endoplasmic reticulum membrane

GO:0031090 : organelle membrane

**Presumptive Null**

No

**Molecular Type**

Coding

**Aberration Type**

SNP

**SNP Coding Change**

Nonsynonymous

**Molecular Details of the Mutation**

Lys484Ser and probably other a.a. substitutions

**Experimental Evidence**

Candidate Gene

	Taxon A	Taxon B	Position
Codon	-	-	-
Amino-acid	Lys	Ser	484

**Main Reference**

Cytochrome P450s in *Papilio multicaudatus* and the transition from oligophagy to polyphagy in the Papilionidae. (2007)

**Authors**

Mao W; Schuler MA; Berenbaum MR

**Abstract**

Although substrate-specific CYP6B1 and CYP6B3 enzymes in *Papilio polyxenes* contribute to specialization on furanocoumarin-containing host plants, CYP6B4 and CYP6B17 enzymes in the polyphagous *Papilio glaucus* and *Papilio canadensis* have a broader range of substrates. *Papilio multicaudatus*, an oligophage with one furanocoumarin-containing host, is putatively ancestral to polyphagous *Papilio* species. Furanocoumarin-inducible CYP6B33-CYP6B37 and CYP6AB6 were characterized from this species. Heterologous expression of CYP6B33 revealed furanocoumarin metabolism resembling that of CYP6B4-CYP6B17 enzymes from *P. glaucus* and *P. canadensis*. Molecular models of CYP6B33 and CYP6B4 indicate that seven conserved aromatic side chains stabilize their hydrophobic catalytic sites and that a Lys484-Ser484 substitution enlarges the CYP6B4 active site pocket to increase the predicted distance between the substrate and reactive oxygen relative to CYP6B1. Loss of specialization in this lineage may have resulted from relatively few mutational changes, allowing acquisition of broader catalytic activities without loss of ancestral furanocoumarin-metabolizing activities.

**Additional References****RELATED GEPHE****Related Genes**

2 (CYP6B1, Na/K-ATPase alpha-subunit)

**Related Haplotypes**

No matches found.

**EXTERNAL LINKS****COMMENTS**

