

GEPHE SUMMARY

Optix ([https://www.gephebase.org/search-criteria?/and+Gene+Gephebase="+Optix+"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=))

Gephebase Gene: GP00000798

Entry Status: Martin

Published

GepheID: Main curator

PHENOTYPIC CHANGE

Morphology ([https://www.gephebase.org/search-criteria?/and+Trait+Category="+Morphology+"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Trait+Category=))

Trait Category

Coloration (wing, Mullerian mimicry) ([https://www.gephebase.org/search-criteria?/and+Trait="+Coloration+\(wing,+Mullerian+mimicry\)+"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Trait=))

Trait

Heliconius melpomene -Postman

Trait State in Taxon A

Heliconius melpomene - rayed

Trait State in Taxon B

Data not curated

Ancestral State

Intraspecific ([https://www.gephebase.org/search-criteria?/and+Taxonomic+Status="+Intraspecific+"#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=))

Taxonomic Status

Taxon A	Latin Name	Taxon B	Latin Name
Heliconius melpomene (<a +heliconius+melpomene+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Heliconius+melpomene+"#gephebase-summary-title)	Heliconius melpomene	Heliconius melpomene (<a +heliconius+melpomene+"#gephebase-summary-title"="" href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms="+Heliconius+melpomene+"#gephebase-summary-title)	Heliconius melpomene
postman butterfly	Common Name	postman butterfly	Common Name
postman butterfly; common postman; Heliconius melpomene (Linnaeus, 1758)	Synonyms	postman butterfly; common postman; Heliconius melpomene (Linnaeus, 1758)	Synonyms
species	Rank	species	Rank
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; Nymphalidae; Heliconiinae; Heliconiini; Heliconius	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; Nymphalidae; Heliconiinae; Heliconiini; Heliconius	Lineage
Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416)	Parent	Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416)	Parent
34740 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=34740)	NCBI Taxonomy ID	34740 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=34740)	NCBI Taxonomy ID
Yes	is Taxon A an Intraspecies?	Yes	is Taxon B an Intraspecies?
Heliconius melpomene -Postman	Taxon A Description	Heliconius melpomene - rayed	Taxon B Description

GENOTYPIC CHANGE

Optix

Generic Gene Name: Q95RW8 (<http://www.uniprot.org/uniprot/Q95RW8>)

Synonyms: anon-WO0153538.79; CG18455; D-Six3; Dmel\CG18455; Dsix3; opt; optix; OPTIX; opx; six3; Six3

String: AEO13434 (<https://www.ncbi.nlm.nih.gov/nuccore/AEO13434>)

7227.FBpp0302920
(http://string-db.org/newstring.cgi/show_network_section.pl?identifier=7227.FBpp0302920)

Sequence Similarities: UniProtKB Drosophila melanogaster

GenebankID or UniProtKB

Belongs to the SIX/Sine oculis homeobox family.

GO - Molecular Function

GO:0043565 : sequence-specific DNA binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0043565>)

GO:0001205 : distal enhancer DNA-binding transcription activator activity, RNA

polymerase II-specific (<https://www.ebi.ac.uk/QuickGO/term/GO:0001205>)
GO:0000976 : transcription regulatory region sequence-specific DNA binding
(<https://www.ebi.ac.uk/QuickGO/term/GO:0000976>)

GO - Biological Process

GO:0045892 : negative regulation of transcription, DNA-templated
(<https://www.ebi.ac.uk/QuickGO/term/GO:0045892>)
GO:0048749 : compound eye development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048749>)
GO:0001751 : compound eye photoreceptor cell differentiation
(<https://www.ebi.ac.uk/QuickGO/term/GO:0001751>)
GO:0048856 : anatomical structure development
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048856>)
GO:0001745 : compound eye morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0001745>)
GO:0048813 : dendrite morphogenesis
(<https://www.ebi.ac.uk/QuickGO/term/GO:0048813>)
GO:0007458 : progression of morphogenetic furrow involved in compound eye
morphogenesis (<https://www.ebi.ac.uk/QuickGO/term/GO:0007458>)

GO - Cellular Component

GO:0005634 : nucleus (<https://www.ebi.ac.uk/QuickGO/term/GO:0005634>)
GO:0005667 : transcription factor complex
(<https://www.ebi.ac.uk/QuickGO/term/GO:0005667>)

Presumptive Null

Unknown (<https://www.gephebase.org/search-criteria?/and+Presumptive Null=~Unknown^#gephebase-summary-title>)

Molecular Type

Cis-regulatory (<https://www.gephebase.org/search-criteria?/and+Molecular Type=~Cis-regulatory^#gephebase-summary-title>)

Aberration Type

Unknown (<https://www.gephebase.org/search-criteria?/and+Aberration Type=~Unknown^#gephebase-summary-title>)

Molecular Details of the Mutation

Not identified

Experimental Evidence

Linkage Mapping (<https://www.gephebase.org/search-criteria?/and+Experimental Evidence=~Linkage Mapping^#gephebase-summary-title>)

Main Reference

optix drives the repeated convergent evolution of butterfly wing pattern mimicry. (2011) (<https://pubmed.ncbi.nlm.nih.gov/21778360>)

Authors

Reed RD; Papa R; Martin A; Hines HM; Counterman BA; Pardo-Diaz C; Jiggins CD; Chamberlain NL; Kronforst MR; Chen R; Halder G; Nijhout HF; McMillan WO

Abstract

Mimicry--whereby warning signals in different species evolve to look similar--has long served as a paradigm of convergent evolution. Little is known, however, about the genes that underlie the evolution of mimetic phenotypes or to what extent the same or different genes drive such convergence. Here, we characterize one of the major genes responsible for mimetic wing pattern evolution in *Heliconius* butterflies. Mapping, gene expression, and population genetic work all identify a single gene, *optix*, that controls extreme red wing pattern variation across multiple species of *Heliconius*. Our results show that the cis-regulatory evolution of a single transcription factor can repeatedly drive the convergent evolution of complex color patterns in distantly related species, thus blurring the distinction between convergence and homology.

Additional References

Wing patterning gene redefines the mimetic history of *Heliconius* butterflies. (2011) (<https://pubmed.ncbi.nlm.nih.gov/22084094>)

RELATED GEPHE

Related Genes

2 (cortex, WntA) (<https://www.gephebase.org/search-criteria?/or+Taxon ID=~34740^/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title>)

Related Haplotypes

No matches found.

EXTERNAL LINKS

COMMENTS