

## GEPHE SUMMARY

<p>WntA (<a href="https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=~WntA^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Gene+Gephebase=~WntA^#gephebase-summary-title</a>)</p> <p>Published</p>	<p>Gephebase Gene</p> <p>Entry Status</p>	<p>GP00001210</p> <p>Courtier</p>	<p>GepheID</p> <p>Main curator</p>
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## PHENOTYPIC CHANGE

<p>Morphology (<a href="https://www.gephebase.org/search-criteria?/and+Trait+Category=~Morphology^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait+Category=~Morphology^#gephebase-summary-title</a>)</p>		<p>Trait Category</p>		
<p>Coloration (wing, Mullerian mimicry) (<a href="https://www.gephebase.org/search-criteria?/and+Trait=~Coloration+(wing,+Mullerian+mimicry)^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Trait=~Coloration+(wing,+Mullerian+mimicry)^#gephebase-summary-title</a>)</p>		<p>Trait</p>		
<p>Heliconius cydno galanthus - "Ac" melanic patch absent = white hourglass pattern present</p>		<p>Trait State in Taxon A</p>		
<p>Heliconius pachinus "Ac" melanic patch present = yellow hourglass pattern absent</p>		<p>Trait State in Taxon B</p>		
<p>Unknown</p>		<p>Ancestral State</p>		
<p>Intraspecific (<a href="https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Intraspecific^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxonomic+Status=~Intraspecific^#gephebase-summary-title</a>)</p>		<p>Taxonomic Status</p>		
<p>Taxon A</p>	<p>Latin Name</p>	<p>Taxon B</p>	<p>Latin Name</p>	
<p>Heliconius cydno (<a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliconius+cydno^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliconius+cydno^#gephebase-summary-title</a>)</p>	<p>Heliconius cydno (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416</a>)</p>	<p>Heliconius pachinus (<a href="https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliconius+pachinus^#gephebase-summary-title">https://www.gephebase.org/search-criteria?/and+Taxon+and+Synonyms=~Heliconius+pachinus^#gephebase-summary-title</a>)</p>	<p>Heliconius pachinus (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428</a>)</p>	
<p>-</p>	<p>-</p>	<p>-</p>	<p>-</p>	
<p>Heliconius cydno Doubleday, 1847</p>	<p>Heliconius cydno pachinus; Heliconius pachinus Salvin, 1871</p>	<p>Heliconius cydno pachinus; Heliconius pachinus Salvin, 1871</p>	<p>Heliconius cydno pachinus; Heliconius pachinus Salvin, 1871</p>	
<p>species</p>	<p>species</p>	<p>species</p>	<p>species</p>	
<p>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</p>	<p>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</p>	<p>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</p>	<p>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</p>	
<p>Heliconius () - (Rank: genus) (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416</a>)</p>	<p>Heliconius () - (Rank: genus) (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416</a>)</p>	<p>Heliconius () - (Rank: genus) (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416</a>)</p>	<p>Heliconius () - (Rank: genus) (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33416</a>)</p>	
<p>33424 (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33424">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33424</a>)</p>	<p>33428 (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428</a>)</p>	<p>33428 (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428</a>)</p>	<p>33428 (<a href="https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428">https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id=33428</a>)</p>	
<p>Yes</p>	<p>Yes</p>	<p>Yes</p>	<p>Yes</p>	
<p>Heliconius cydno galanthus - "Ac" melanic patch absent = white hourglass pattern present</p>	<p>Heliconius pachinus "Ac" melanic patch present = yellow hourglass pattern absent</p>	<p>Heliconius pachinus "Ac" melanic patch present = yellow hourglass pattern absent</p>	<p>Heliconius pachinus "Ac" melanic patch present = yellow hourglass pattern absent</p>	

## GENOTYPIC CHANGE

<p>WntA</p> <p>-</p> <p>-</p>	<p>Generic Gene Name</p> <p>Synonyms</p> <p>String</p> <p>Sequence Similarities</p>	<p>A0A077DF90 (<a href="http://www.uniprot.org/uniprot/A0A077DF90">http://www.uniprot.org/uniprot/A0A077DF90</a>)</p> <p>JN944585 (<a href="https://www.ncbi.nlm.nih.gov/nucleotide/JN944585">https://www.ncbi.nlm.nih.gov/nucleotide/JN944585</a>)</p>	<p>UniProtKB Vanessa cardui</p> <p>GenebankID or UniProtKB</p>
<p>Belongs to the Wnt family.</p>		<p>GO - Molecular Function</p>	
<p>GO:0005102 : signaling receptor binding (<a href="https://www.ebi.ac.uk/QuickGO/term/GO:0005102">https://www.ebi.ac.uk/QuickGO/term/GO:0005102</a>)</p>		<p>GO - Biological Process</p>	
<p>GO:0007275 : multicellular organism development (<a href="https://www.ebi.ac.uk/QuickGO/term/GO:0007275">https://www.ebi.ac.uk/QuickGO/term/GO:0007275</a>)</p> <p>GO:0016055 : Wnt signaling pathway</p>			

(<https://www.ebi.ac.uk/QuickGO/term/GO:0016055>)

GO - Cellular Component

GO:0005576 : extracellular region (<https://www.ebi.ac.uk/QuickGO/term/GO:0005576>)

Presumptive Null

No ([https://www.gephebase.org/search-criteria?/and+Presumptive Null=~No~#gephebase-summary-title](https://www.gephebase.org/search-criteria?/and+Presumptive+Null=~No~#gephebase-summary-title))

Molecular Type

Cis-regulatory ([https://www.gephebase.org/search-criteria?/and+Molecular Type=~Cis-regulatory~#gephebase-summary-title](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](https://www.gephebase.org/search-criteria?/and+Aberration+Type=~Unknown~#gephebase-summary-title))

Molecular Details of the Mutation

Complex cis-regulatory haplotype : 170 fixed differences were detected among comparisons of allopatric *H. c. galanthus* and *H. pachinus*

Experimental Evidence

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

Main Reference

Diversification of complex butterfly wing patterns by repeated regulatory evolution of a Wnt ligand. (2012) (<https://pubmed.ncbi.nlm.nih.gov/22802635>)

Authors

Martin A; Papa R; Nadeau NJ; Hill RI; Counterman BA; Halder G; Jiggins CD; Kronforst MR; Long AD; McMillan WO; Reed RD

Abstract

Although animals display a rich variety of shapes and patterns, the genetic changes that explain how complex forms arise are still unclear. Here we take advantage of the extensive diversity of *Heliconius* butterflies to identify a gene that causes adaptive variation of black wing patterns within and between species. Linkage mapping in two species groups, gene-expression analysis in seven species, and pharmacological treatments all indicate that cis-regulatory evolution of the WntA ligand underpins discrete changes in color pattern features across the *Heliconius* genus. These results illustrate how the direct modulation of morphogen sources can generate a wide array of unique morphologies, thus providing a link between natural genetic variation, pattern formation, and adaptation.

Additional References

Ancient homology underlies adaptive mimetic diversity across butterflies. (2014) (<https://pubmed.ncbi.nlm.nih.gov/25198507>)

## RELATED GEPHE

Related Genes

2 (aristaless, Optix) ([https://www.gephebase.org/search-criteria?/or+Taxon ID=~33424~/and+Trait=Coloration/or+Taxon ID=~33428~/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Taxon+ID=~33424~/and+Trait=Coloration/or+Taxon+ID=~33428~/and+Trait=Coloration/and+groupHaplotypes=true#gephebase-summary-title))

Related Haplotypes

1 ([https://www.gephebase.org/search-criteria?/or+Gene Gephebase=~WntA~/and+Taxon ID=~33424~/or+Gene Gephebase=~WntA~/and+Taxon ID=~33428~/#gephebase-summary-title](https://www.gephebase.org/search-criteria?/or+Gene+Gephebase=~WntA~/and+Taxon+ID=~33424~/or+Gene+Gephebase=~WntA~/and+Taxon+ID=~33428~/#gephebase-summary-title))

## EXTERNAL LINKS

## COMMENTS