GEPHE SUMMARY

Gephebase Gene
WntA (https://www.gephebase.org/search-criteria?/and+Gene Gephebase=^WntA^#gephebase-summary-title)

GepheID
GP00001210

Entry Status
Published

Main curator
Courtier

PHENOTYPIC CHANGE

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

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

Trait State in Taxon A
Heliconius cydno galanthus - "Ac" melanic patch absent = white hourglass pattern present

Trait State in Taxon B
Heliconius pachinus "Ac" melanic patch present = yellow hourglass pattern absent

Ancestral State
Unknown

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

Taxon A

Latin Name
Heliconius cydno (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Heliconius cydno^#gephebase-summary-title)

Common Name
-

Synonyms
Heliconius cydno Doubleday, 1847

Rank
species

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

Parent
Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33416)

NCBI Taxonomy ID
33424 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33424)

is Taxon A an Infraspecies?
Yes

Taxon A Description
Heliconius cydno galanthus - "Ac" melanic patch absent = white hourglass pattern present

Taxon B

Latin Name
Heliconius pachinus (https://www.gephebase.org/search-criteria?/and+Taxon and Synonyms=^Heliconius pachinus^#gephebase-summary-title)

Common Name
-

Synonyms
Heliconius cydno pachinus; Heliconius pachinus Salvin, 1871

Rank
species

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

Parent
Heliconius () - (Rank: genus) (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33416)

NCBI Taxonomy ID
33428 (https://www.ncbi.nlm.nih.gov/Taxonomy/Browser/wwwtax.cgi?id= 33428)

is Taxon B an Infraspecies?
Yes

Taxon B Description
Heliconius pachinus "Ac" melanic patch present = yellow hourglass pattern absent

GENOTYPIC CHANGE

Generic Gene Name
WntA

Synonyms
-

String
-

Sequence Similarities
Belongs to the Wnt family.

GO - Molecular Function
GO:0005102 : signaling receptor binding (https://www.ebi.ac.uk/QuickGO/term/GO:0005102)

GO - Biological Process
GO:0007275 : multicellular organism development (https://www.ebi.ac.uk/QuickGO/term/GO:0007275)
GO:0016055 : Wnt signaling pathway

UniProtKB Vanessa cardui
A0A077DF90 (http://www.uniprot.org/uniprot/A0A077DF90)

GenebankID or UniProtKB
JN944585 (https://www.ncbi.nlm.nih.gov/nuccore/JN944585)

(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)

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

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)

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)

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)

EXTERNAL LINKS

COMMENTS